Cisco ICS 7750 System Description

Release 2.3.0

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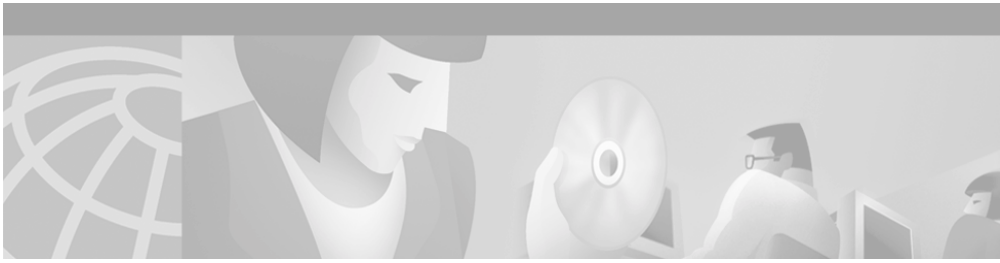

Preface

The Cisco Integrated Communications System (ICS) 7750 (referred to from this point on as the *Cisco ICS 7750* or the *system*) is an integrated communications platform designed to enable easy, rapid deployment and management of key data and converged voice/data applications and services, including IP telephony, content delivery networking, and multiservice routing. The Cisco ICS 7750 gives businesses a cost-effective platform for quick deployment of New World applications such as Cisco CallManager, Cisco Unity Voice Messaging, and Cisco Customer Response Applications (CRA).

The Cisco ICS 7750 has all the elements needed to deliver data, voice, and video in a single chassis—multiservice router/voice gateway cards based on Cisco IOS software, application server cards running core voice applications, call-processing software, web-based system management software, a data switching interface card for connectivity to Ethernet switches, and a card that monitors system health.

This section discusses the intended audience and organization of this *Cisco ICS 7750 System Description* and defines the conventions used to convey instructions and information.

Audience

This guide is for information technology (IT) managers, enterprise-branch office (EBO) managers, Cisco resellers, and marketing professionals who are planning to use a Cisco ICS 7750 in their network.

Note This guide is not intended to instruct you on how to install or service a Cisco ICS 7750 but rather is intended to provide an overview of how to use the product in voice and data networking.

Organization

This guide is organized as follows:

- Chapter 1, "Overview," provides a functional overview, describes the features, and gives a system overview of the Cisco ICS 7750.
- Chapter 2, "Processor Cards Feature Summary," describes the features of the cards supported by the Cisco ICS 7750, such as the analog station interface (ASI), system processing engine (SPE), system switch processor (SSP), multiservice route processor (MRP), and system alarm processor (SAP).
- Chapter 3, "Summary of Power and Cooling System Features," describes the features of the chassis, backplane, power supplies, and fan tray of the Cisco ICS 7750.
- Chapter 4, "Summary of System Software Features," describes the features of the system software, such as the ICSConfig program, Cisco ICS System Manager, and the Fault Management Module (FMM).
- Chapter 5, "Summary of Software Applications Features," describes the features of applications that are supported on the Cisco ICS 7750, such as Cisco CallManager, Cisco IOS Firewall, Cisco Unity, and AutoAttendant.
- Chapter 6, "Features of Cisco IP Phones," describes the features of the Cisco IP Phones and the Cisco IP SoftPhone and WebAttendant applications.
- Chapter 7, "Features of LAN-Based Switching Technologies," describes the features of the Catalyst 3524-PWR XL switch, the Catalyst 4000 switch, and the Catalyst 6000 switch.
- "Chapter 8, "Features of Other Compatible Cisco Devices," describes the features of the Cisco 1750 Modular Access Router, the Catalyst 2600 switch, the Catalyst 2900 series switches, the Cisco Voice Gateway 200, and the DT-24+ and DE-30+ modules.

Related Documentation

This section describes other publications in the Cisco ICS 7750 documentation set as well as related Cisco publications.

Cisco ICS 7750 Documentation

To see a list of Cisco ICS 7750 documentation, refer to the *Cisco ICS 7750 Documentation Locator for Release 2.2.0*.

For a high-level overview of the Cisco ICS 7750 system, refer to the *Cisco ICS 7750 Documentation Roadmap*.

Backup Power Supply Documentation

For information about the backup power supply options supported by the Cisco ICS 7750, refer to the following publications:

- *Cisco RPS 300 Redundant Power System Hardware Installation Guide*
- *User's Manual APC Smart-UPS*

VIC, WIC, and VWIC Documentation

For information about voice interface card (VIC), WAN interface card (WIC), and voice WAN interface card (VWIC) installation, cabling, and configuration, refer to the *Cisco Interface Cards Installation Guide*.

Catalyst 3500 Series XL Documentation

For information about the Catalyst 3500 series XL switches, including the Catalyst 3524-PWR XL switch, refer to the following publications:

- *Quick Start Guide: Catalyst 3500 Series XL Switches*
- *Catalyst 3500 Series XL Hardware Installation Guide*
- *Catalyst GigaStack Gigabit Interface Converter Installation Guide*

- *Cisco IOS Desktop Switching Software Configuration Guide: Catalyst 2900 Series XL and Catalyst 3500 Series XL Cisco IOS 12.0(5)XU*
- *Cisco IOS Desktop Switching Command Reference* (online only)

Cisco IP Phone Documentation

For information about Cisco IP Phones, refer to the following publications:

- *Getting Started with the Cisco IP Phone 7910*
- *Cisco IP Phone Models 7960 and 7940 User Guide*
- *Cisco IP Phone Administration Guide for Cisco CallManager*

Obtaining Documentation

The following sections explain how to obtain documentation from Cisco Systems.

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The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available through the Cisco TAC: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

Cisco TAC Web Site

The Cisco TAC Web Site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to the following URL:

http://www.cisco.com/tac

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

http://www.cisco.com/register/

If you cannot resolve your technical issues by using the Cisco TAC Web Site, and you are a Cisco.com registered user, you can open a case online by using the TAC Case Open tool at the following URL:

http://www.cisco.com/tac/caseopen

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web Site.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number.

Overview

This chapter introduces the Cisco ICS 7750 and includes the following sections:

- Introduction, page 1-1
- Making Converged Networks a Reality, page 1-4

Introduction

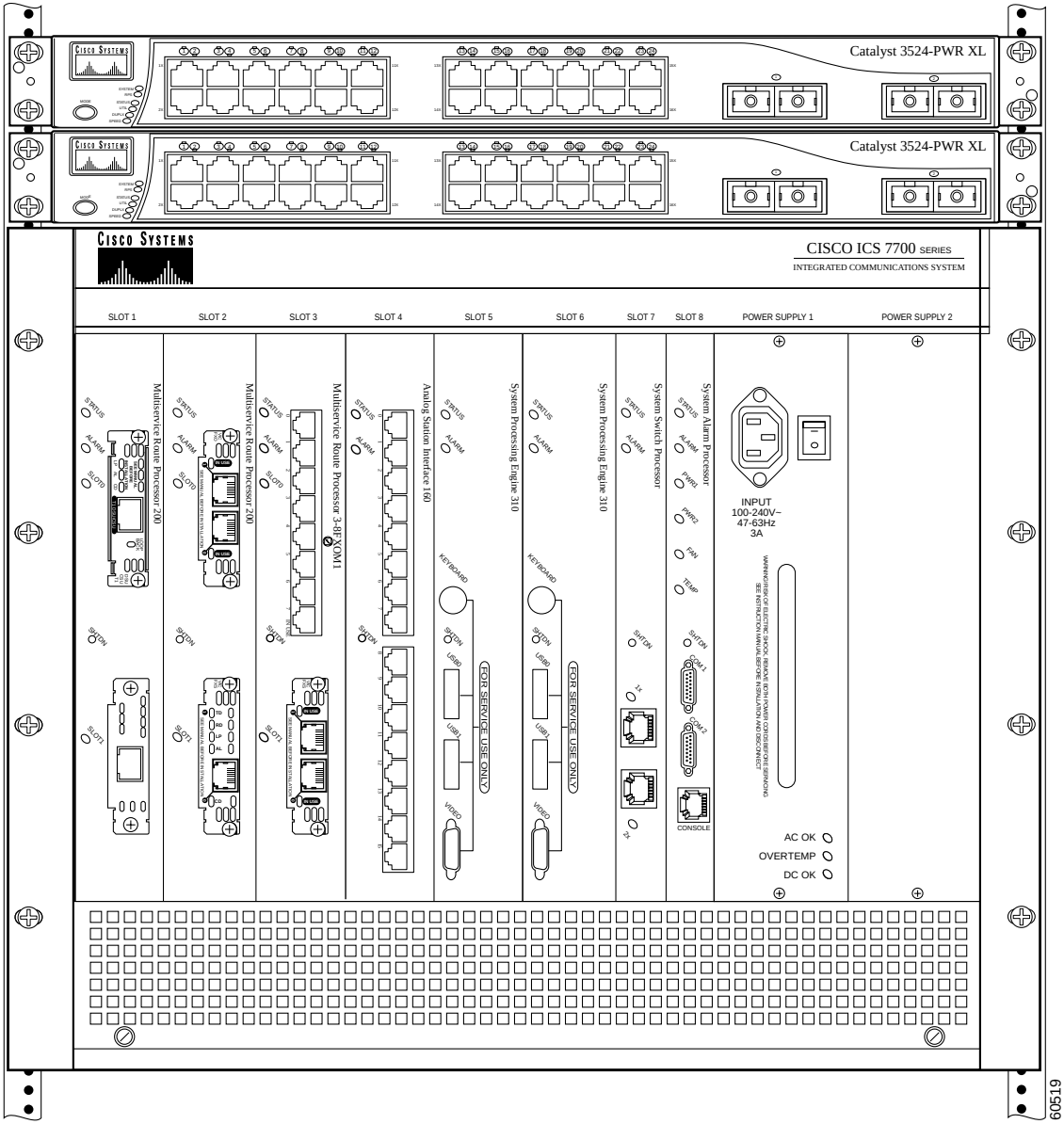
The Cisco ICS 7750 is an all-in-one solution that enables you to migrate from a circuit-switched network to an IP telephony network. The Cisco ICS 7750 is a six-universal-slot, industry-grade chassis system. Each universal slot accepts a router/gateway or single-board computer card to address the widest range of data and voice connectivity and application needs.

By deploying the Cisco ICS 7750 with quality of service (QoS)–enabled Catalyst series switches, you can choose the switching solution that best meets your needs.

The Cisco ICS 7750 also supports the Cisco IP Phone 7900 series, a new generation of display-based intelligent communication devices that can be powered from Catalyst 3524-PWR XL switches, an integrated Catalyst switch card, or the Catalyst inline power patch panel.

Figure 1-1 shows the Cisco ICS 7750 chassis with two Catalyst 3524-PWR XL switches.

Figure 1-1 Cisco ICS 7750 and Catalyst 3524-PWR XL Switches



Processor Cards

Table 1-1 lists the processor cards that are available for use in the Cisco ICS 7750 chassis.

Table 1-1 Cisco ICS 7750 Processor Cards

Card Type	Card Names	Chassis Slot	Description
Multiservice router/voice gateway	• Multiservice route processor (MRP) • Analog station interface (ASI)	1-6	MRP cards run Cisco IOS and provide the functionality of multiservice routers and H.323-compliant voice gateways. Analog station interface (ASI) cards add support for high-density analog Foreign Exchange Station (FXS) ports (8- and 16-port versions are available). Flash memory is an option that is available for the MRP and ASI cards.
Single-board computer/ application server	System processing engine (SPE)	1-6	SPE cards run integrated Web-based system management software (Cisco ICS 7700 System Manager), call-processing software (Cisco CallManager), and IP telephony applications (Cisco Unity).
Ethernet switch	System switch processor (SSP)	7	The SSP card runs Cisco IOS and integrates the Cisco ICS 7750 with your switched Ethernet 10/100 backbone.
Hardware monitor	System alarm processor (SAP)	8	The SAP card sends fault detection and system monitoring information to the fault management module that is embedded in the Cisco ICS 7700 System Manager software.

Note For additional information about processor cards, see Chapter 2, "Processor Cards Feature Summary."

Making Converged Networks a Reality

The Cisco ICS 7750 is a new offering in the Cisco Architecture for Integrated Voice, Video, and Data (AVVID) product line. By combining the elements needed to build a complete IP telephony system, including data and voice networking, the Cisco ICS 7750 provides a truly "converged" solution. The modular design of the Cisco ICS 7750 gives you the flexibility to choose the capabilities you need now while enabling you to add capacity, redundancy, and e-business applications as your needs change.

Cisco AVVID

The Cisco ICS 7750 is built on the open and scalable Cisco AVVID. Cisco AVVID includes three components: infrastructure, such as switches and routers; clients, such as IP phones, H.323 videoconferencing equipment, and PCs; and applications, such as call control. Cisco AVVID is an architecture for integrated data, voice, and video over a common IP transport. For more information, refer to the white paper *Architecture for Voice, Video and Integrated Data*.

Cisco IP Telephony Architecture

Cisco AVVID is an open, standards-based architecture for Voice over IP (VoIP). Unlike traditional office environments, in which the data and voice networks are separate (see Figure 1-2), in a converged network, the telephony and IP components are integrated (see Figure 1-3).

Figure 1-2 Separate Voice and Data Networks

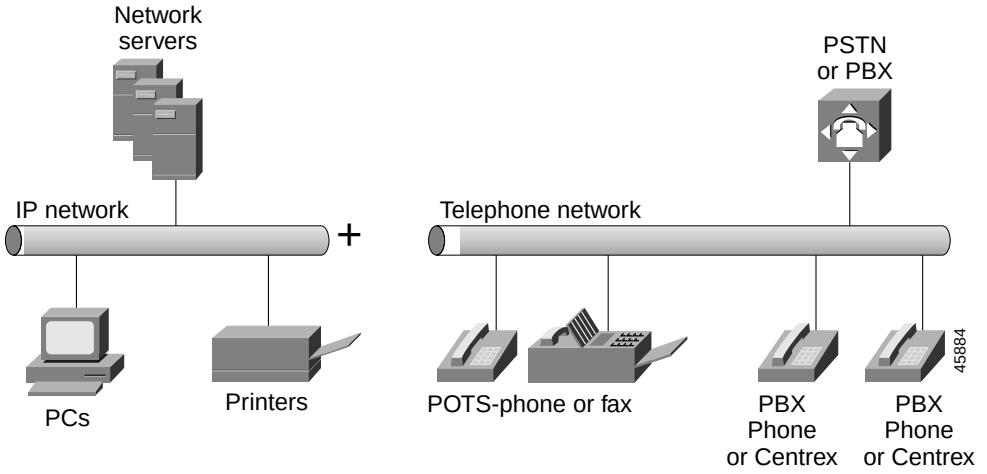
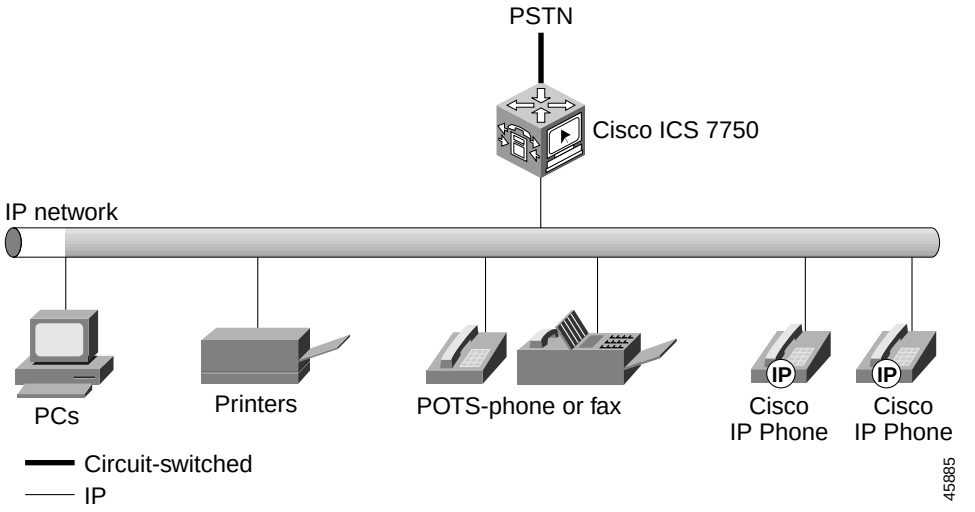


Figure 1-3 Voice and Data Networks Integrated with the Cisco ICS 7750



Advantages of Converged Networks

Because converged networks use a single, packet-based infrastructure for all data, voice, and video communications, implementing such networks reduces costs. The following are additional advantages of converged networks:

- Budget leverage. You can reduce your telecom budget and devote the money saved to other purposes, such as information systems.
- Integration of campus and branch office networking equipment. By deploying products such as the Cisco MCS 7800 series, the Cisco ICS 7750, and Cisco IP Phones, you can phase out proprietary technologies with high capital and operations costs—such as private branch exchanges (PBXs).
- Support for emerging software applications. Use of the open, standards-based Cisco AVVID architecture helps you take advantage of the latest business applications, such as unified voice and e-mail messaging, web-based call centers, and computer telephony integration (CTI).
- Cisco IP Phones do away with the costs and inconvenience associated with traditional telephone moves, adds, and changes by taking advantage of the Dynamic Host Configuration Protocol (DHCP).

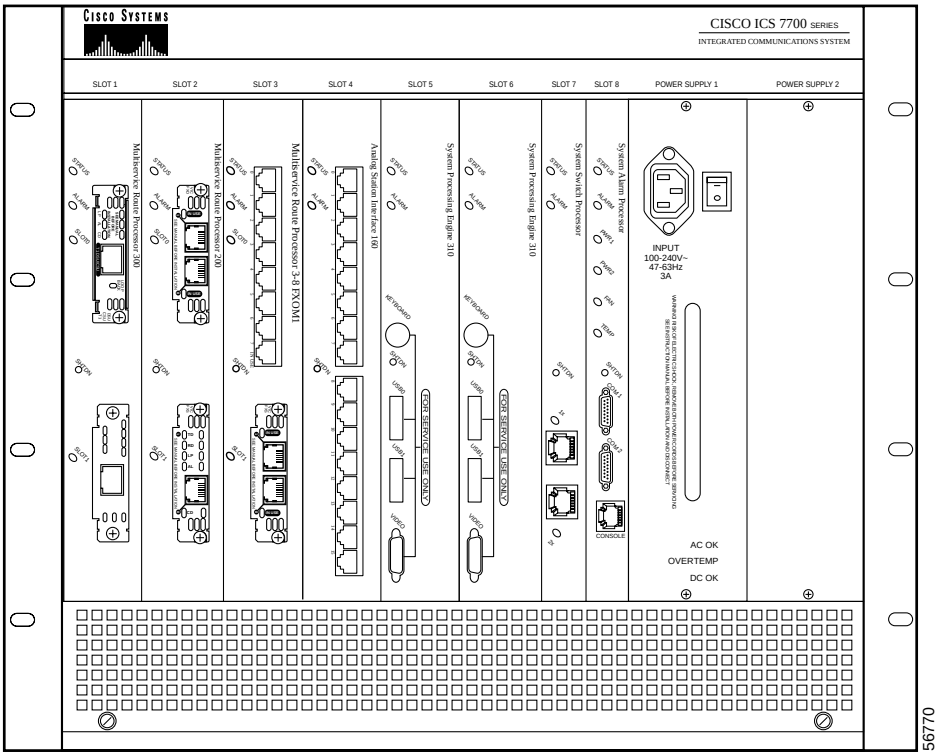
Processor Cards Feature Summary

Processor cards supported by the Cisco ICS 7750 include the following:

- System Processing Engine Card, page 2-2
- System Switch Processor Card, page 2-7
- System Alarm Processor Card, page 2-12
- Multiservice Route Processor Card, page 2-16
- Analog Station Interface Cards, page 2-22
- Voice and WAN Interface Cards, page 2-29

Figure 2-1 shows the Cisco ICS 7750 with all these cards installed. The voice and WAN interface cards are not visible because they are installed on analog station interface and multiservice route processor cards.

Figure 2-1 Cisco ICS 7750 System Cards



System Processing Engine Card

The system processing engine (SPE) card for the Cisco ICS 7750 is a single-board, Windows 2000–based computer that runs Cisco CallManager, Cisco ICS 7700 System Manager, embedded fault-management services, and other system software applications. The SPE can also support applications such as voice messaging and automated attendant, interactive voice response (IVR), voice messaging, and automatic call distribution (ACD).

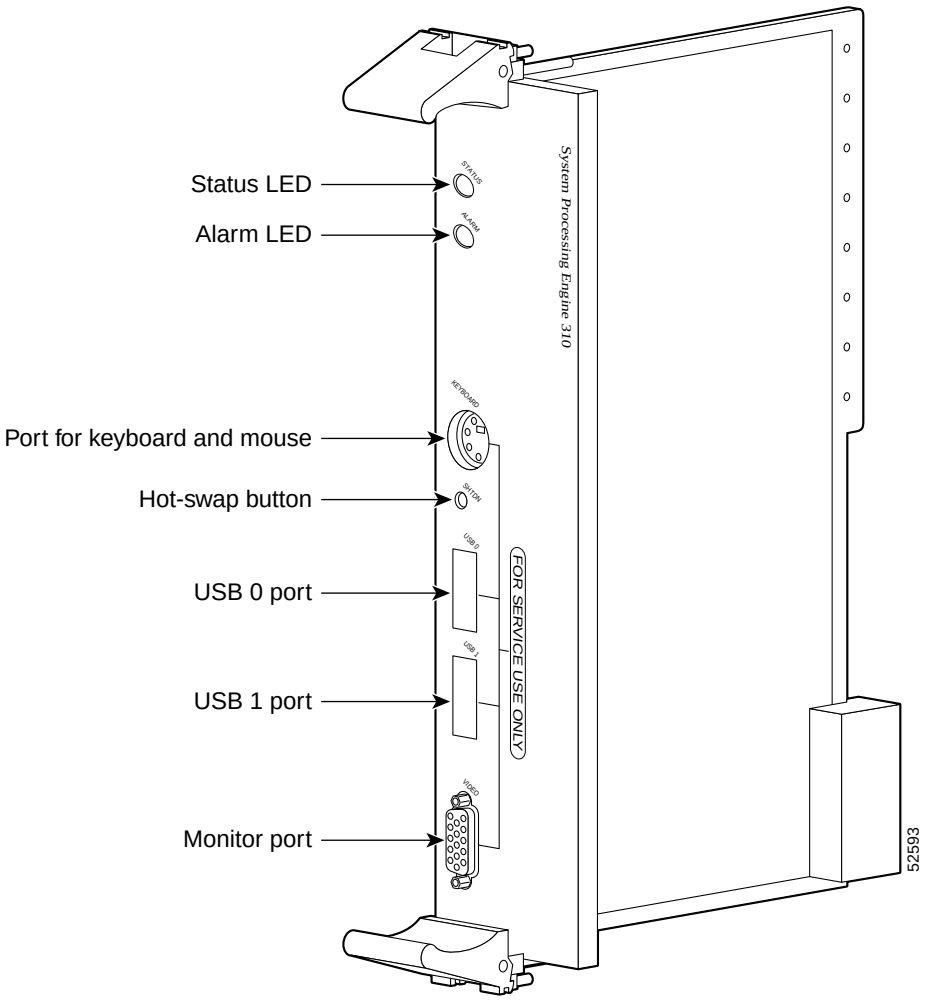
The SPE can reside in any of the interchangeable slots (1 through 6) of the Cisco ICS 7750 chassis. The Cisco ICS 7750 requires at least one SPE and allows a maximum of five SPEs. The SPE is hot-swappable.

System redundancy is highly recommended. You can easily build in redundancy by adding SPEs for additional call-processing capabilities. For recovery, you should regularly perform a backup of all applications installed on the SPE, using the backup mechanisms that are recommended in the documentation for each application.

Note SPE200 cards that were used prior to system software release 2.1.0 are now obsolete. If you have a system with SPE200 cards and wish to install and use system software release 2.1.0 or later, you must replace the SPE200 cards with SPE310 cards. The SPE310 offers a keyboard and mouse port, a video port, and two universal serial bus (USB) ports supporting standard USB devices such as pointing devices and CD-ROM drives. The keyboard and mouse port can be used to connect simultaneously to a keyboard and a mouse, using the Y-cable that is included with the hardware. These SPE310 ports are required for Cisco CallManager installation and upgrades on the Cisco ICS 7750, beginning with system software release 2.1.0.

Figure 2-2 shows the SPE310 card.

Figure 2-2 SPE310 Card



Feature Summary

Key features and benefits of the SPE310 include the following:

- This card has a 700-MHz Pentium III processor, a 32-KB Level 1 cache, and a 256-KB Level 2 cache.
- This card has 512 MB of onboard memory (on the motherboard) and two 168-pin dual in-line memory module (DIMM) sockets. Each socket can hold a 256-MB DIMM or a 512-MB DIMM, for a maximum card memory capacity of 1.5 GB.
- Onboard BIOS is stored in 512-KB Flash memory.
- Onboard 20.4-GB or 40-GB hard disk drive.
- Real-time clock, two-level watchdog timer.
- The front panel has LEDs, a keyboard and mouse port, two USB ports, and a video port.
- Scalability—You can add SPEs to meet communication application needs required by providers.
- Serviceability—The SPE is hot-swappable, making the card easy to manage and service, which increases system availability.
- Functionality—The SPE supports the following software:
  - Cisco ICS 7700 System Manager
  - ICS Core Software, including the Fault Management Module
  - Cisco CallManager
  - Cisco Unity Voice Messaging
  - Cisco IP Interactive Voice Response (IVR) and Cisco Integrated Contact Distribution (ICD)
  - Microsoft Terminal Services Client
  - Microsoft Windows 2000

Technical Specifications

Table 2-1 lists the technical specifications for the SPE card.

Table 2-1 Technical Specifications for the SPE Card

Type	Description
Processor	Intel Pentium III 700 MHz CPU
Memory	1.5-GB SDRAM maximum
Storage	20.4-GB or 40-GB hard disk drive
Operating system	Microsoft Windows 2000 Server
Database software	Microsoft SQL Server 7.0
Dimensions and weight	Height: 10.5 in. (26.67 cm) Width: 1.6 in. (4.06 cm) Depth: 8.25 in. (20.96 cm), with ejector handle Depth: 7.0 in. (17.78 cm), without ejector handle Weight: 2.06 lb (0.936 kg)
Power requirements	DC voltages: 2.3A at +5V 2.1A at +3.3V 0.4A at +12V Negligible current at –12V
Power dissipation	20W
Operating environment	Temperature range: 32 to 104ºF (0 to 40ºC) Altitude: up to 10,000 ft (3000 m) Relative humidity: 10 to 85% Shock: up to 27 in. per second (0.69 m per second) Vibration: 0.35 Grms from 3 to 500 Hz
Nonoperating (storage) environment	Temperature shock: –4 to 149ºF (–20 to 65ºC) at 41ºF (5ºC) per minute Temperature range: –4 to 149ºF (–20 to 65ºC) Altitude: up to 15,000 ft (4570 m) Relative humidity: 5 to 95%

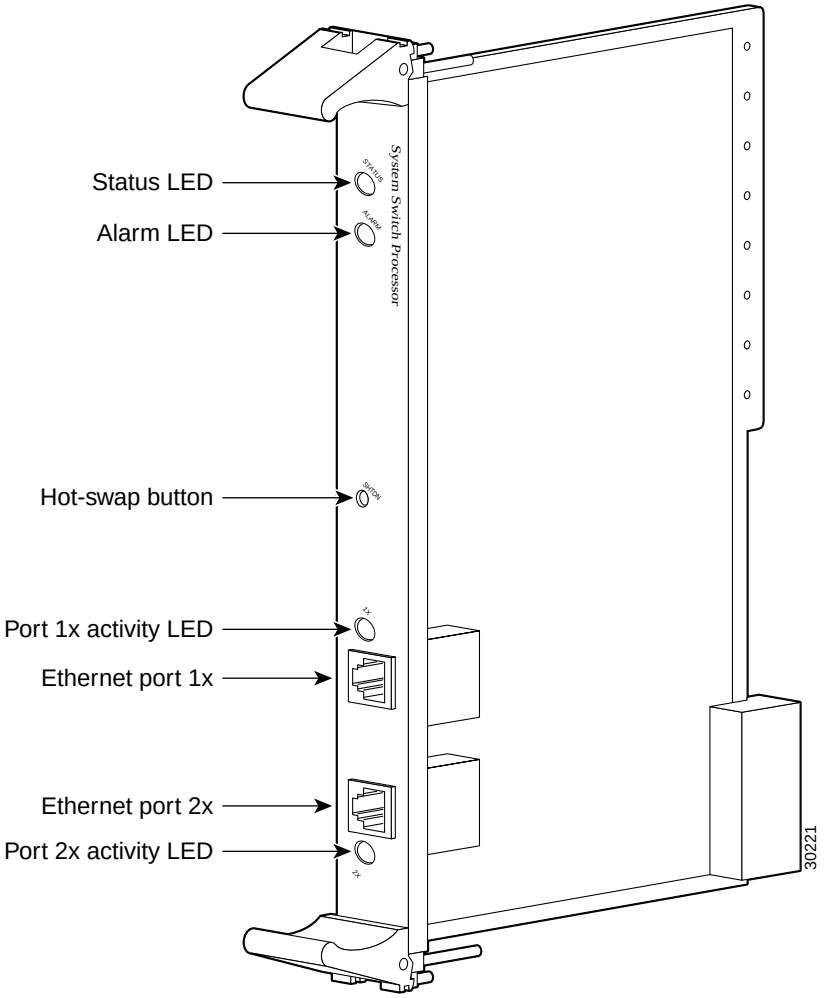
Table 2-1 Technical Specifications for the SPE Card (continued)

Type	Description
Safety	C-UL per CSA C22.2 1950 TUV Bauart per EN 60950 UL recognized per UL 1950 3rd edition
Emissions standards	BSMI CNS13438, Class B CISPR22, 1997, Class B CFR47, Part 15, Subpart B, 1995, Class B EN 55022:1998, Class B EN 55024:1998, Class B ITE Immunity Standard ICES003, issue 3:1998, Class B IEC 1000-4-2:1995 Immunity to electrostatic discharges IEC 1000-4-3:1995 Immunity to radio frequency electromagnetic fields IEC 1000-4-4:1995 Immunity to electrical fast transients IEC 1000-4-5:1995 Immunity to power line transients (surges) IEC 1000-4-6:1995 Immunity to radio frequency-induced conducted disturbances IEC 1000-4-8:1995 Immunity to power frequency magnetic fields IEC 1000-4-11:1995 Immunity to voltage dips, voltage variations, and short voltage interruptions VCCI V-3/97.04, Class B

System Switch Processor Card

The system switch processor (SSP) card is an IOS-based Ethernet switch that passes data between all system cards to any Catalyst switches connected to the Cisco ICS 7750. The SSP supports eight 10/100 Mbps Ethernet connections, which are bidirectional, full-duplex, and can autosense speed and autonegotiate transmission mode. The Cisco ICS 7750 requires one SSP, which must reside in slot 7. The SSP is hot-swappable. Figure 2-3 shows the SSP card.

Figure 2-3 SSP Card



Two of the SSP Ethernet ports are external 10/100 Ethernet RJ-45 ports on the front panel, used for switching functionality between the Cisco ICS 7750 and any connected Catalyst 3500 Series XL or other Catalyst switches. One port is used as the primary link, and the second link is used for redundancy. The other six internal Ethernet ports support the universal slots on the backplane.

The Ethernet ports are identified as follows:

- f0/1—External 1x port for connecting to 10BASE-T, 100BASE-TX, and 10/100 Ethernet switches
- f0/2—External 2x port for connecting to 10BASE-T, 100BASE-TX, and 10/100 Ethernet switches
- f0/3—Slot 1
- f0/4—Slot 2
- f0/5—Slot 3
- f0/6—Slot 4
- f0/7—Slot 5
- f0/8—Slot 6

Feature Summary

Key features and benefits of the SSP include the following:

- 10BASE-T/100BASE-TX support—The 10/100 Ethernet support delivers high performance where required. Any investment in legacy 10BASE-T equipment is preserved.
- Autosensing—Each 10/100 port detects the speed of an attached device and automatically configures the port for 10 or 100 Mbps. Autosensing eases deployment in mixed 10BASE-T and 100BASE-T environments.
- Autonegotiating—Each 10/100 port automatically selects half- or full-duplex transmission mode to optimize bandwidth utilization.
- Flash memory—The SSP stores configuration information in Flash memory and NVRAM.
- Supports IEEE 802.1p class of service (CoS) with two queues on each port to prioritize voice and data traffic.
- Supports quality of service (QoS).

- High performance—The SSP is compatible with the Catalyst 2900 Series XL Cisco switch to provide the following features:
  - 10.8-Gbps switching fabric.
  - Cisco Group Management Protocol (CGMP) enables a switch to selectively forward routed IP multicast traffic to targeted multimedia end stations only.
- Management and system setup—The SSP supports powerful management software and system functions:
  - Simple Network Management Protocol (SNMP), Telnet interface, and command-line interface (CLI) support.
  - Telnet support for five simultaneous sessions.
  - Cluster Management Suite (CMS), a web-based switch management tool that can be launched from the ICS System Manager software.
  - CiscoWorks Windows and CiscoWorks2000 network management software.
  - Cisco Discovery Protocol (CDP).
  - Embedded Remote Monitoring (RMON) for monitoring the history, statistics, alarms, and events.
  - Network statistics (per port or using an RMON probe).
  - Switched Port Analyzer (SPAN) support for connecting to a network analyzer or RMON probe.
  - Autoconfiguration.
  - Trivial File Transport Protocol (TFTP).
  - Default configuration stored in Flash memory.
  - Address Resolution Protocol (ARP) support.

- Security—The SSP supports the following security features:
  - Secure addressing secures a port to an individual Media Access Control (MAC) address or a group of up to 132 MAC addresses. Addresses can be learned or entered manually.
  - Administrators can choose the level of security, notification, and resulting actions.
  - Password-protected in-band and out-of-band management.
  - Multilevel security on console access to prevent unauthorized users from altering the switch configuration.

Technical Specifications

Table 2-2 lists the technical specifications for the SSP card.

Table 2-2 Technical Specifications for the SSP Card

Type	Description
Dimensions and weight	Height: 10.5 in. (26.67 cm) Width: 0.8 in. (2.03 cm) Depth: 8.25 in. (20.96 cm), with ejector handle Depth: 7.0 in. (17.78 cm), without ejector handle Weight: 0.69 lb (0.31 kg)
Cisco IOS requirement	• 12.0(5.2)XU for system software release 2.1.0 • 12.0(5)WC2b for system software release 2.2.0 • 12.0(5)WC5 for system software release 2.3.0
Power requirements	DC input voltages: 9A at +5V 0.5A at +12V
Operating environment	Temperature range: 32 to 104ºF (0 to 40ºC) Altitude: up to 10,000 ft (3000 m) Relative humidity: 10 to 85% Shock: up to 27 in. per second (0.69 m per second) Vibration: 0.35 Grms from 3 to 500 Hz

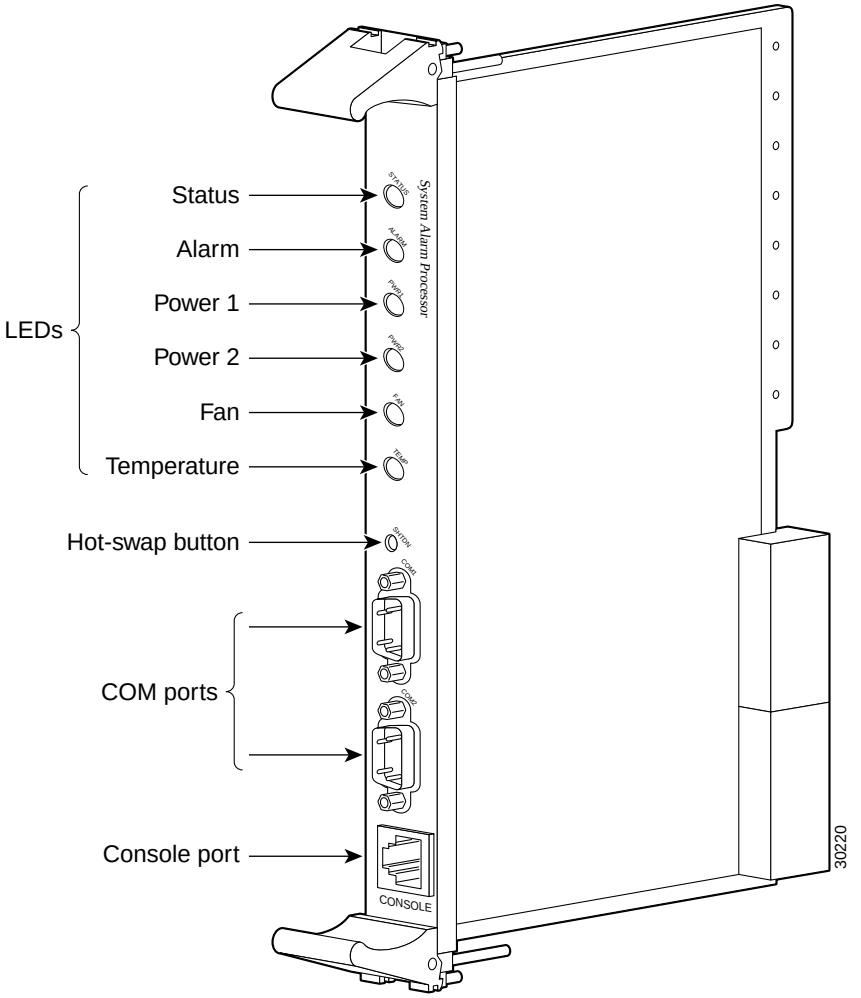
Table 2-2 Technical Specifications for the SSP Card (continued)

Type	Description
Nonoperating (storage) environment	Temperature shock: –4 to 149ºF (–20 to 65ºC) at 41ºF (5ºC) per minute Temperature range: –4 to 149ºF (–20 to 65ºC) Altitude: up to 15,000 ft (4570 m) Relative humidity: 5 to 95%
Safety	AS/NZS 3260, TS001 CE IEC 950/EN 60950 UL 1950/CSA 22.2 No. 950
Emissions standards	AS/NZS 3548 Class A BCIQ CE EN 55022 Class A (CISPR 22 Class A) FCC Part 15 Class A VCCI Class A

System Alarm Processor Card

The system alarm processor (SAP) card monitors the internal chassis and card temperatures, power supply voltages, and chassis cooling fan speeds. The SAP reports real-time data to the SPE cards. The Cisco ICS 7750 requires one SAP card, which must reside in slot 8. Figure 2-4 shows the SAP card.

Figure 2-4 SAP Card



Feature Summary

Key features and benefits of the SAP include the following two COM ports and one console port:

- The COM 1 port is a 115-kbps port that supports a 9-pin RS-232 cable. Use this port for monitoring an uninterruptible power supply (UPS).
- The COM 2 port is a 115-kbps port that supports a 9-pin RS-232 cable. Use this port for connecting to a legacy voice-mail system (Simplified Message Desk Interface (SMDI) only).
- The console port enables you to monitor and manage the system by connecting a terminal or communicating over a modem connection (9600 baud maximum).

Technical Specifications

Table 2-3 lists the technical specifications for the SAP card.

Table 2-3 Technical Specifications for the SAP Card

Type	Description
Dimensions and weight	Height: 10.5 in. (26.67 cm) Width: 0.8 in. (2.03 cm) Depth: 8.25 in. (20.96 cm), with ejector handle Depth: 7.0 in. (17.78 cm), without ejector handle Weight: 0.70 lb (0.32 kg)
Power requirements	DC input voltages: 0.99A at +5V 0.05A at +12V 0.05A at –12V
Operating environment	Temperature range: 32 to 104ºF (0 to 40ºC) Altitude: up to 10,000 ft (3000 m) Relative humidity: 10 to 85% Shock: up to 27 in. per second (0.69 m per second) Vibration: 0.35 Grms from 3 to 500 Hz

Table 2-3 Technical Specifications for the SAP Card (continued)

Type	Description
Nonoperating (storage) environment	Temperature shock: –4 to 149ºF (–20 to 65ºC) at 41ºF (5ºC) per minute Temperature range: –4 to 149ºF (–20 to 65ºC) Altitude: up to 15,000 ft (4570 m) Relative humidity: 5 to 95%
Emissions and immunity standards	CFR47, Part 15, Class B radiated and conducted emissions limits, Subpart B, 1995, unintentional radiators EN 55022: 1998, Class B Radiated and Conducted Emissions, ITE EN 50082-1:1996 Generic Immunity Standard EN 55024:1998 ITE Immunity Standard ENV 50140:1993 Immunity to radio frequency electromagnetic fields ENV 50141: 1993, Immunity to radio frequency induced conducted disturbances ENV 50204: 1995, Immunity to radio frequency electromagnetic field from digital radio telephones IEC 1000-4-2: 1995, Immunity to electrostatic discharges IEC 1000-4-3: 1995, Immunity to radio frequency electromagnetic fields IEC 1000-4-4:1995, Immunity to electrical fast transients IEC 1000-4-5:1995, Immunity to power line transients (surges) IEC 1000-4-6:1996, Immunity to radio frequency induced conducted disturbances IEC 1000-4-8:1995, Immunity to power frequency magnetic fields IEC 1000-4-11:1995, Immunity to voltage dips, voltage variations, and short voltage interpretations

Multiservice Route Processor Card

The multiservice route processor (MRP) card is a voice- and data-capable router that supports both digital and analog voice trunks and WAN routing interfaces. Using the MRP you can link remote Ethernet LANs to the Public Switched Telephone Network (PSTN) and existing private branch exchanges (PBXs), as well as most common analog devices such as fax machines and teleconferencing stations. The MRP card accepts voice interface cards (VICs), WAN interface cards (WICs), and voice WAN interface cards (VWICs) for complete integration of voice and data networking.

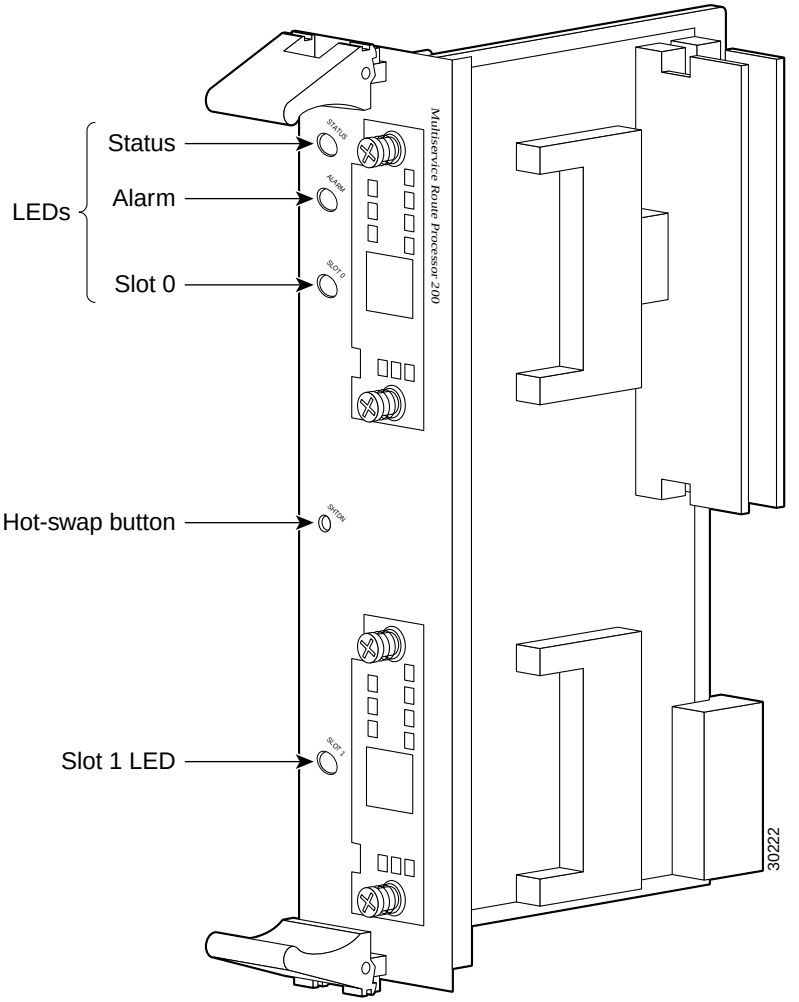
The MRP can reside in any of the interchangeable slots (slot 1 through slot 6). The Cisco ICS 7750 supports up to five MRP cards. The MRP card is hot-swappable.

MRP cards are available with onboard Flash memory (MRP300) or without Flash memory (MRP200). A mixture of MRP300 and MRP200 cards on the same chassis is supported.

Note For information about the VICs, WICs, and VWICs that are supported on the MRP card, see "Voice and WAN Interface Cards" section on page 2-29.

Figure 2-5 shows the MRP card.

Figure 2-5 MRP Card



Feature Summary

Key features and benefits of the MRP include the following:

- Digital signal processor (DSP) support—Supports up to ten DSPs; each DSP can handle multiple voice channels, depending on the codec complexity.
- Interface cards support—The MRP architecture incorporates VIC, WIC, and VWIC cards, a RAM memory expansion slot, packet voice data module (PVDM) slots, and a Virtual Private Network (VPN) module slot.
- Internet and intranet access—Cisco IOS software features enable the MRP to communicate across both intranets and the Internet:
  - Multiprotocol routing (IP, Internetwork Packet Exchange [IPX], and AppleTalk), IBM/SNA, and transparent bridging over ISDN, asynchronous serial, and synchronous serial such as leased lines, Frame Relay, Switched Multimegabit Data Service (SMDS), Switched 56, and X.25
  - WAN optimization, including dial-on-demand routing (DDR), bandwidth-on-demand (BOD) and Open Shortest Path First (OSPF)-on-demand circuit, snapshot routing, compression, filtering, and spoofing
- Network security features—Access control lists (ACLs), user authentication, authorization, and accounting (such as Password Authentication Protocol/Challenge Handshake Authentication Protocol [PAP/CHAP], TACACS+, and RADIUS), and data encryption.
- Internal LAN security—Integrated Cisco IOS Firewall Feature Set uses context-based access control (CBAC) to protect internal LANs from attacks.
- External data security—IPSec tunneling with Data Encryption Standard (DES) and Triple DES (3DES) encryption provide standards-based data privacy, integrity, and authenticity as data travels through a public network.
- Remote access security—For remote access VPNs, Layer 2 Forwarding (L2F) and Layer 2 Tunneling Protocol (L2TP) combine with IP Security (IPSec) encryption to provide a secure multiprotocol solution (for IP, IPX, and AppleTalk traffic).
- QoS capabilities—Resource Reservation Protocol (RSVP), weighted fair queuing (WFQ), committed access rate (CAR), and IP precedence enable businesses to prioritize traffic on their networks by user, application, traffic type, and other parameters.

- Voice compression—Up to six voice calls can occupy a single 64-KB data channel simultaneously, without compromising data performance. Cisco IOS voice-compression technology integrates data and voice traffic to enable use of existing data networks.
- High-performance RISC architecture—Supports VPN applications with tunneling and security, and DSL, cable, and other broadband access technologies. A slot on the MRP supports an optional VPN module that provides IPSec DES and 3DES encryption at T1/E1 speeds in hardware.
- SNMP support—The ICS System Manager supports SNMP to operate with CiscoWorks2000 to provide central monitoring and troubleshooting of remote Cisco ICS 7750 systems.
- Data transfer—Each MRP card supports a data transfer speed of up to the equivalent of three T1 lines, with a maximum of one T1 voice span. Also, each MRP card supports a maximum of four data ports or four voice ports.
- Flash memory on the MRP300—The MRP300 has 16 MB of onboard Flash memory and an expansion single in-line memory module (SIMM) slot that can take an additional 16, 32, or 64 MB of Flash memory. A total of 80 MB of addressable Flash memory is supported.

Technical Specifications

Table 2-4 lists the technical specifications for the MRP200 and MRP300 cards.

Table 2-4 Technical Specifications for the MRP200 and MRP300 Cards

Type	Description
Board	Universal card slot
Memory	64-MB DRAM (maximum 128 MB)
Memory upgrade options	16- and 32-MB DRAM
Flash memory (MRP300 only)	16-MB SIMM
Optional Flash SIMM module (MRP300 only)	80-pin SIMM module for adding up to 64 MB of Flash memory, using a single 16-, 32-, or 64-MB Flash SIMM
Optional cards	Two modular VIC, WIC, or VWIC card slots per MRP card

Table 2-4 Technical Specifications for the MRP200 and MRP300 Cards (continued)

Type	Description
Expansion slots	Two packet voice/data module (PVDM) expansion slots, supporting 4-, 8-, 12-, 16-, and 20-channel PVDMs **Note** For a list of MRP card PVDM requirements for any supported combination of WICs, VICs, and VWICs, refer to the "PVDM Requirements" appendix in the *Cisco ICS 7750 Installation and Configuration Guide.* One VPN module socket, supporting DES and 3DES encryption for full-duplex T1 serial connection (4-Mbps for 1514-byte packets)
Cisco IOS requirement	• For MRP200: – 12.2(1) (for QoS) – 12.1(5)T2 (for G.723.1 and G.726 codecs) – 12.1(3)XI1 (for baseline functionality) – 12.2(4)XL1 (for system software release 2.1.0) – 12.2(4)XL4 (for system software release 2.2.0) • For MRP300: 12.2(4)YH
Advanced data networking features	VPN, IPSec 56 and 3DES, Firewall
Codecs	G.711, G.723.1, G.726, and G.729a
Dimensions and weight	Height: 10.5 in. (26.67 cm) Width: 1.6 in. (4.06 cm) Depth: 8.25 in. (20.96 cm), with ejector handle Depth: 7.0 in. (17.78 cm), without ejector handle Weight: 1.04 lb (0.471 kg), with no VICs, WICs, or VWICs installed
Power requirements	DC voltages: 0.95A at +5V 0.55A at +3.3V 0.75A at +12V Negligible current at –12V
Power dissipation	14W

Table 2-4 Technical Specifications for the MRP200 and MRP300 Cards (continued)

Type	Description
Operating environment	Temperature range: 32 to 104ºF (0 to 40ºC) Altitude: 10,000 ft (3000 m) Relative humidity: 10 to 85% Shock: 54 in./s (1.37 m/s) Vibration: 0.35 Grms from 3 to 500 Hz
Nonoperating (storage) environment	Temperature shock: –4 to 149ºF (–20 to 65ºC) at 41ºF (5ºC) per minute Temperature range: –4 to 149ºF (–20 to 65ºC) Altitude: 15,000 ft (4570 m) Relative humidity: 5 to 95%
Safety	C-UL per CSA C22.2 1950 TUV Bauart per EN 60950 UL recognized per UL 1950 3rd edition
Emissions standards	BSMI CNS13438, Class B CFR47, Part 15, Subpart B, 1995, Class B EN 55022:1998 EN 55024:1997 EN 55024:1998, Class B ITE Immunity Standard ICES003, issue 3: 1998, Class B IEC 1000-4-2:1995 Immunity to electrostatic discharges IEC 1000-4-3:1995 Immunity to radio frequency electromagnetic fields IEC 1000-4-4:1995 Immunity to electrical fast transients IEC 1000-4-5:1995 Immunity to power line transients (surges) IEC 1000-4-6:1995 Immunity to radio frequency-induced conducted disturbances IEC 1000-4-8:1995 Immunity to power frequency magnetic fields IEC 1000-4-11:1995 Immunity to voltage dips, voltage variations, and short voltage interruptions ISPR22, 1997, Class B VCCI V-3/97.04, Class B
Telecom	Australia CAC TS-002, TS-003, TS-004, TS-031 Canadian CS-03 European RTTE Directive 99/05/EC FCC Part 68

Analog Station Interface Cards

Analog station interface (ASI) cards enable you to connect to analog telephones, fax machines, and teleconferencing stations. Two ASI cards are available:

- ASI81—Contains an 8-port Foreign Exchange Station (FXS) module and any one of the VIC, WIC, or VWIC modules shown in Table 2-6 that support digital and analog voice trunks and WAN routing interfaces, completely integrating voice and data networking.
- MRP3-8FXS—Contains an 8-port FXS module and onboard Flash memory.
- ASI160—Contains a 16-port FXS module.
- MRP3-16FXS—Contains a 16-port FXS module and onboard Flash memory.

ASI cards can reside in any of the interchangeable slots (slot 1 through slot 6). Figure 2-6 shows the ASI81 card. Figure 2-7 shows the ASI160 card.

Note For information about the VICs, WICs, and VWICs that are supported on the ASI81 card, see the "Voice and WAN Interface Cards" section on page 2-29.

Figure 2-6 ASI81 Card

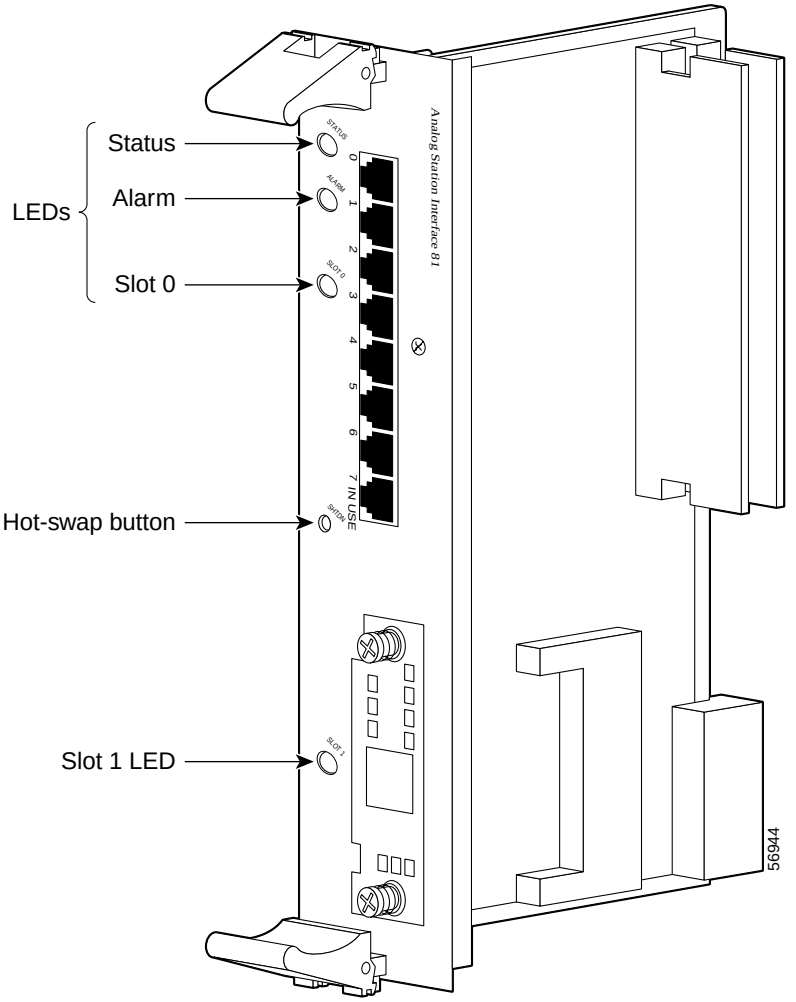
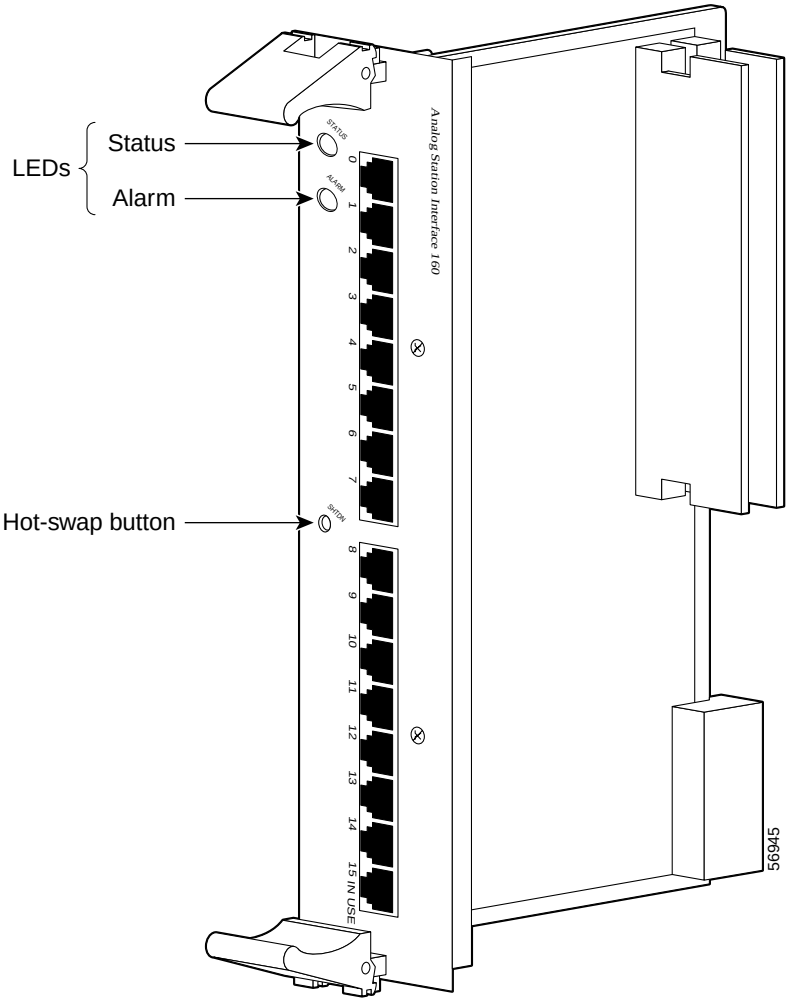


Figure 2-7 ASI160 Card



Feature Summary

Key features and benefits of the ASI81, MRP3-8FXS, ASI160, and MRP3-16FXS cards include the following:

- High-density analog port support—Enables you to continue to support analog telephones as you migrate to IP Phones.
- DSP support—Supports up to eight DSPs on the ASI160 and MRP3-16FXS, or ten DSPs on the ASI81 and MRP3-8FXS. Each DSP can handle multiple voice channels, depending on the codec complexity.
- SNMP support—The ICS System Manager supports SNMP to operate with CiscoWorks2000 to provide central monitoring and troubleshooting of remote Cisco ICS 7750 systems.

Additional benefits of the ASI81 and MRP3-8FXS include the following:

- Flexibility—The modular design encourages customization of the Cisco ICS 7750 to meet particular voice and data communication needs, easily adding capacity, Cisco IOS services, and redundancy as needs change.
- Reliability—Proven Cisco IOS technology delivers reliable, end-to-end QoS over the PSTN and WAN among your branch offices, customers, and partners.
- Investment protection—The architecture of the ASI81 and MRP3-8FXS incorporates VICs, WICs, and VWICs, a RAM memory expansion slot, and PVDM options.
- Internet and intranet access—Cisco IOS software provides features that make the ASI81 ideal for communications across both intranets and the Internet:
  - Multiprotocol routing (IP, IPX, and AppleTalk), IBM/SNA, and transparent bridging over ISDN, asynchronous serial, and synchronous serial such as leased lines, Frame Relay, SMDS, Switched 56, and X.25.
  - WAN optimization, including DDR, BOD, and OSPF-on-demand circuit, snapshot routing, compression, filtering, and spoofing to reduce WAN costs.
- Network security features—ACLs, user authentication, authorization, and accounting (such as PAP/CHAP, TACACS+, and RADIUS), and data encryption.
- Internal LAN security—Integrated Cisco IOS Firewall Feature Set using CBAC to protect internal LANs from attacks.

- External data security—IPSec tunneling with DES and 3DES encryption provide standards-based data privacy, integrity, and authenticity as data travels through a public network.
- Remote access security—For remote access VPNs, L2F and L2TP combine with IPSec encryption to provide a secure multiprotocol solution (for IP, IPX, and AppleTalk traffic). Mobile users can dial in to a service provider's local POP. Data is tunneled (or encapsulated inside a second protocol such as IPSec or L2TP) back to the ASI81 to securely access the corporate network via the Internet.
- QoS capabilities—RSVP, WFQ, CAR, and IP precedence enable businesses to prioritize traffic on their networks by user, application, traffic type, and other parameters, to ensure that business-critical data and delay-sensitive voice receive appropriate priority.
- Robust voice compression—Up to six voice calls can occupy a single 64-KB data channel simultaneously, without compromising data performance. Cisco IOS voice-compression technology integrates data and voice traffic to enable efficient use of existing data networks.
- High-performance RISC architecture—Supports VPN applications with tunneling and security, and DSL, cable, and other broadband access technologies.

Technical Specifications

Table 2-5 lists the technical specifications for the ASI81, ASI160, MRP3-8FXS, and MRP3-16FXS cards.

Table 2-5 Technical Specifications for the ASI and MRP3 Cards

Type	Description
Board	Universal card slot
Memory	64-MB DRAM (maximum 128 MB)
Memory upgrade options	16- and 32-MB DRAM
Flash memory (MRP3-8FXS and MRP3-16FXS only)	16-MB SIMM

Table 2-5 Technical Specifications for the ASI and MRP3 Cards (continued)

Type	Description
Optional Flash SIMM module (MRP3-8FXS and MRP3-16FXS only)	80-pin SIMM module for adding up to 64 MB of Flash memory, using a single 16-, 32-, or 64-MB Flash SIMM
Optional cards	ASI81 and MRP3-8FXS: One modular VIC/WIC/VWIC slot
Expansion slots	Two PVDM expansion slots, supporting 4-, 8-, 12-, 16-, and 20-channel PVDMs (16-channel PVDMs are recommended)
Cisco IOS requirement	• ASI cards: 12.2(1) • MRP3 cards: 12.2(4)YH
Advanced data networking features	IPSec 56, 3DES, Firewall
Codecs	G.711, G.723.1, G.726, and G.729a
Dimensions and weight	Height: 10.5 in. (26.67 cm) Width: 1.6 in. (4.06 cm) Depth: 8.25 in. (20.96 cm), with ejector handle Depth: 7.0 in. (17.78 cm), without ejector handle Weight (ASI81): 1.15 lb (0.52 kg), with no VICs, WICs, or VWICs installed Weight (ASI160): 1.36 lb (0.62 kg)
Power requirements	DC voltages: 0.95A at +5V 0.55A at +3.3V 0.75A at +12V Negligible current at –12V
Power dissipation	14W
Operating environment	Temperature range: 32 to 104ºF (0 to 40ºC) Altitude: 10,000 ft (3000 m) Relative humidity: 10 to 85% Shock: 54 in./s (1.37 m/s) Vibration: 0.35 Grms from 3 to 500 Hz
Nonoperating (storage) environment	Temperature shock: –4 to 149ºF (–20 to 65ºC) at 41ºF (5ºC) per minute Temperature range: –4 to 149ºF (–20 to 65ºC) Altitude: 15,000 ft (4570 m) Relative humidity: 5 to 95%

Table 2-5 Technical Specifications for the ASI and MRP3 Cards (continued)

Type	Description
Safety	C-UL per CSA C22.2 1950 TUV Bauart per EN 60950 UL recognized per UL 1950 3rd edition
Emissions standards	BSMI CNS13438, Class B CAN/CSA-C22.2 No. 950-95, Safety of information technology equipment including Electrical business equipment [Canada] CISPR22, 1997, Class B CFR47, Part 15, Subpart B, 1995, Class B EN 55024:1998, Class B ITE Immunity Standard EN 60950:1992, Safety of information technology equipment (Amendment 4, 1997-10) [CENELEC; includes EU and EFTA] GB 4943-95, Safety of information technology equipment [PRC] ICES003, issue 3:1998, Class B IEC 60950:1991 Safety of information technology equipment (Amendment 4, 1996-97) IEC 1000-4-2:1995 Immunity to electrostatic discharges IEC 1000-4-3:1995 Immunity to radio frequency electromagnetic fields IEC 1000-4-4:1995 Immunity to electrical fast transients IEC 1000-4-5:1995 Immunity to power line transients (surges) IEC 1000-4-6:1995 Immunity to radio frequency-induced conducted disturbances IEC 1000-4-8:1995 Immunity to power frequency magnetic fields IEC 1000-4-11:1995 Immunity to voltage dips, voltage variations, and short voltage interruptions IEC 60950:1991, Safety of information technology equipment (Amendment 4, 1996-97) NOM-019-SCFI-1998, Safety of data processing equipment [Mexico] TS001, Approval and test specification, Safety of information technology equipment including electrical business equipment (Australia) UL 1950, 3rd. Edition, 1995, Standard for safety for information technology equipment [US] VCCI V-3/97.04, Class B
Telecom	Australia CAC TS-002, TS-003, TS-004, TS-031 Canadian CS-03 European RTTE Directive 99/05/EC FCC Part 68

Voice and WAN Interface Cards

MRP200 and MRP300 cards have two slots while ASI81 and MRP3-8FXS cards have one slot that accept existing VICs, WICs, and VWICs that are used in Cisco 1700, 2600, and 3600 series routers. This interface card support helps you build upon existing Cisco networks while maintaining interoperability and consistent end-to-end service between locations. Table 2-6 lists the WIC, VIC, and VWIC cards supported by MRP200, MRP300, ASI81, and MRP3-8FXS cards.

Table 2-6 WIC, VIC, and VWIC Cards for MRP, ASI81, and MRP3-8FXS Cards

Module	Description
VIC-2DID	Two-port analog DID[1] voice/fax interface card
VIC-2BRI-NT/TE	Two-port ISDN[2] BRI[3] voice/fax interface card (network and terminal side)
VIC-2FXS	Two-port FXS voice/fax interface card
VIC-2FXO-M1, VIC-2FXO	Two-port FXO[4] voice/fax interface card with battery reversal detection and caller ID support (for North America)
VIC-2FXO-M2	Two-port FXO voice/fax interface card with battery reversal detection and caller ID support (for Europe)
VIC-2FXO-M3	Two-port FXO voice/fax interface card with battery reversal detection and caller ID support (for Australia)
VIC-4FXS/DID	Four-port FXS and DID voice/fax interface card
VIC-2E/M	Two-port E&M[5] voice/fax interface card
WIC-1T	One-port serial, asynchronous and synchronous (T1/E1)
WIC-2T	Two-port serial, asynchronous and synchronous (T1/E1)
WIC-2A/S	Two-port serial, low speed (up to 128 kbps), asynchronous and synchronous
WIC-1B-S/T	One-port ISDN BRI (S/T interface)
WIC-1B-U	One-port ISDN BRI with integrated NT1 (U interface)
WIC-1DSU-56K4	One-port, four-wire 56-kbps CSU/DSU[6]
WIC-1DSU-T1	One-port, T1/fractional T1 CSU/DSU
VWIC-1MFT-T1	One-port T1/fractional T1 multiflex trunk with CSU/DSU
VWIC-1MFT-E1	One-port E1/fractional E1 multiflex trunk with CSU/DSU

Table 2-6 WIC, VIC, and VWIC Cards for MRP, ASI81, and MRP3-8FXS Cards (continued)

Module	Description
VWIC-2MFT-T1	Two-port T1/fractional T1 multiflex trunk with CSU/DSU
VWIC-2MFT-E1	Two-port E1/fractional E1 multiflex trunk with CSU/DSU

1. DID = Direct Inward Dialing
2. ISDN = Integrated Services Digital Network
3. BRI = Basic Rate Interface
4. FXO = Foreign Exchange Office
5. E&M = ear and mouth
6. CSU/DSU = channel service unit/data service unit

VICs

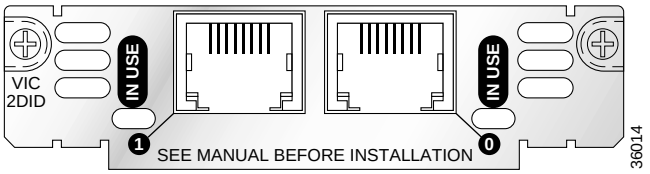
This section describes the VICS that are available for use in the MRP card and the ASI81 and MRP3-FXS card:

- VIC-2DID
- VIC-2BRI-NT/TE
- VIC-2FXS
- VIC-4FXS/DID
- VIC-2FXO-M1, VIC-2FXO-M2, and VIC-FXO-M3

VIC-2DID

The VIC-2DID card is a DID interface card with two ports (see Figure 2-8). Use this card to connect directly to a PSTN line that has been provisioned for DID or to connect to a PBX.

Figure 2-8 2-Port Analog DID Card, VIC-2DID



Technical Specifications

Table 2-7 lists the technical specifications for the VIC-2DID card.

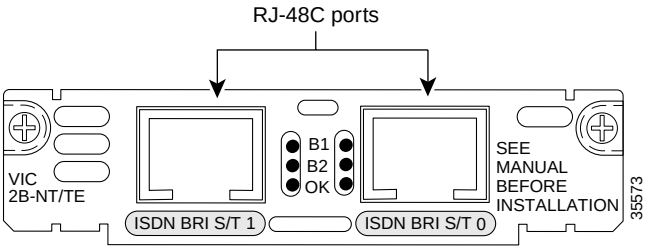
Table 2-7 Technical Specifications for VIC-2DID Card

Type	Description
Interface type	Direct Inward Dialing
Signaling formats	Ground start, loop start, loop-reverse battery, delay dial
Physical connector	RJ-11
Number of connectors/ports	Two
Cisco IOS requirement	12.1(5)XM Plus or later
Spare	VIC-2DID=

VIC-2BRI-NT/TE

The VIC-2BRI-NT/TE card is an ISDN BRI interface network and terminal sides card with two ports (see Figure 2-9). Use this card to connect directly to ISDN PBXs and key systems.

Figure 2-9 2-Port ISDN BRI Card, VIC-2BRI-NT/TE



Technical Specifications

Table 2-8 lists the technical specifications for the VIC-2BRI-NT/TE card.

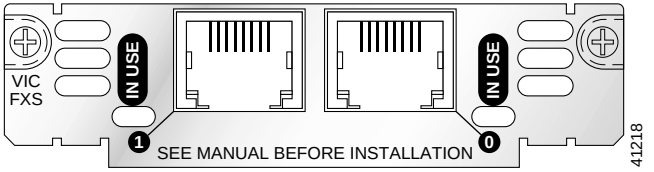
Table 2-8 Technical Specifications for VIC-2BRI-NT/TE Card

Type	Description
Interface type	ISDN BRI
Interface	Four-wire user side S/T or network side NT
ISDN Digital Access	BRI 4B+2D
Physical connector	RJ-48C
Number of connectors/ports	Two
Cisco IOS requirement	12.1(3)XI or later
Compliance	FCC Part 68, CS03, CTR3, TS-031, Japanese Approvals Institute for Telecommunications Equipment (JATE) Green Book
ITU Compliance	ITU-T Q.920, Q.921, Q.930, Q.931
Safety conformance	UL 1950, CAN/CSA-C22.2, IEC 950, EN60950
Spare	VIC-2BRI-NT/TE=

VIC-2FXS

The VIC-2FXS card is an FXS interface card with two ports (see Figure 2-10). Use the FXS card to connect directly to phones, fax machines, and key systems.

Figure 2-10 2-Port VIC with FXS, FXO, or E&M Interfaces (Typical)



Technical Specifications

Table 2-9 lists the technical specifications for the VIC-2FXS card.

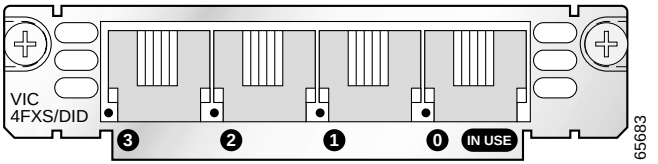
Table 2-9 Technical Specifications for VIC-2FXS Card

Type	Description
Interface type	FXS
Address signaling formats	In-band dual tone multifrequency (DTMF) Out-of-band pulse (10/20 pps)
Signaling formats	Loop start, ground start
Ringing tone	Configurable for different country requirements
Ringing voltage	Less than 45 Vrms at 5 ringer equivalence number (REN) at 25 Hz (configurable frequency)
Ringing frequencies	20 Hz, 50 Hz
Physical connector	RJ-11
Number of connectors/ports	Two
Cisco IOS requirement	IOS Plus 12.0(7)XK1 or 12.1(2)T or later (for battery polarity reversal) IOS Plus 12.1(2)XH or later (for caller ID)
Compliance	FCC Class B device, CE
Safety conformance	UL1950
Spare	VIC-2FXS=

VIC-4FXS/DID

The VIC-4FXS/DID card supports up to four FXS ports or DID analog trunks. Each port on the VIC-4FXS/DID can be configured to be used in FXS or DID mode.

Figure 2-11 VIC-4FXS/DID Card



Technical Specifications

Table 2-10 lists the technical specifications for the VIC-4FXS/DID card.

Table 2-10 Technical Specifications for VIC-4FXS/DID Card

Type	Description
Interface type	FXS or DID
Address signaling formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling modes	• FXS—Loop start • DID—Wink, immediate, and delay dial
Tone disconnect supervision	DID—Power denial (Caller Party Control and far-end disconnect)
Ringing frequencies	20 Hz, 50 Hz
Physical connector	RJ-11
Number of connectors/ports	Four
Cisco IOS requirement	12.2(4)XL3
Compliance	FCC Part 15 Class B
Safety conformance	UL 1950
FXS homologation	USA (TIA/EIA-15-968), Canada (CS-03 I)

Table 2-10 Technical Specifications for VIC-4FXS/DID Card (continued)

Type	Description
DID homologation	USA (TIA/EIA-15-968), Australia (ACIF S002/S003)
Spare	VIC-4FXS/DID=

VIC-2FXO-M1, VIC-2FXO-M2, and VIC-FXO-M3

The VIC-2FXO card is a two-port FXO interface card with battery reversal detection and caller ID support and is available for the following locations:

- VIC-2FXO-M1—North America
- VIC-2FXO-M2—Europe
- VIC-2FXO-M3—Australia

Use these cards to connect to PBXs or key systems and to provide off-premises connections.

Technical Specifications

Table 2-11 lists the technical specifications for the VIC-2FXO-M1, VIC-2FXO-M2, and VIC-2FXO-M3 cards.

Table 2-11 Technical Specifications for VIC-2FXO Cards

Type	Description
Interface type	FXO
Address signaling formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling formats	Loop start, ground start
Tone disconnect supervision	Call disconnect on progress tone of less than 600 Hz
Power interrupt disconnect	Call disconnect on power interrupt of greater than 600 ms
Battery polarity reversal detection	Detection of disconnect supervision and far-end answer supervision through battery polarity reversal
Physical connector	RJ-11
Number of connectors/ports	Two

Table 2-11 Technical Specifications for VIC-2FXO Cards (continued)

Type	Description
Cisco IOS requirement	• VIC-2FXO-M1, VIC-2FXO-M2: 11.3(4)T or later • VIC-2FXO-M3: 11.3(6)T or later or 12.0(2)T or later
Compliance	• VIC-2FXO-M1: FCC Part 68, CS-03 Part I, JATE Blue Book • VIC-2FXO-M2: CE, CTR-21 • VIC-2FXO-M3: ACA TS002, ACA TS003
Safety conformance	UL1950
Spare	VIC-2FXO-M1=, VIC-2FXO-M2=, VIC-2FXO-M3=

VIC-2E/M

The VIC-2E/M card is a two-port E&M analog interface card (see Figure 2-10). Use the VIC-2E/M card to connect to PBX or key system trunk lines.

Technical Specifications

Table 2-12 lists the technical specifications for the VIC-2E/M card.

Table 2-12 Technical Specifications for VIC-2E/M Card

Type	Description
Interface type	E&M
Address signaling formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling formats	Immediate, delay dial, wink start
Signaling types	I, II, III, and IV
E-Lead current limit	100 mA
M-Lead sensitivity	Greater than 3 mA
Pulse distortion	Less than 2%
Physical connector	Four wire/two wire
Number of connectors/ports	Two

Table 2-12 Technical Specifications for VIC-2E/M Card (continued)

Type	Description
Cisco IOS requirement	12.1(5)XM1 or later
Compliance	FCC Class B device, CE
Safety conformance	UL1950
Spare	VIC-2E/M=

WICs

This section describes the WICS that are available for use in the MRP card, the ASI81 card, and the MRP3-8FXS card:

- WIC-1T and WIC-2T
- WIC-2A/S
- WIC-1B-S/T
- WIC-1B-U
- WIC-1DSU-56K4
- WIC-1DSU-T1

WIC-1T and WIC-2T

The WIC-1T card is a single-port, asynchronous and synchronous, serial interface card (see Figure 2-12). The WIC-2T is a two-port, asynchronous and synchronous, serial interface card (see Figure 2-13). Use the WIC-1T or WIC-2T card for low-density, high-speed remote or branch office connectivity.

Figure 2-12 One-Port Serial WAN Interface Card, WIC-1T

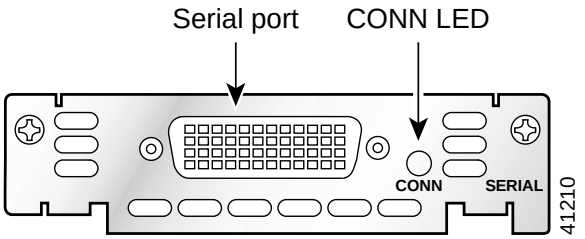
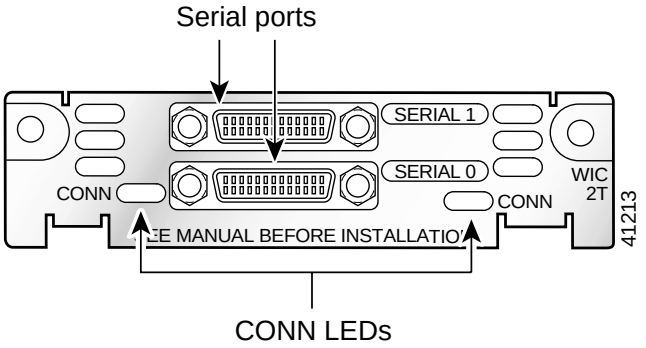


Figure 2-13 Two-Port Serial WAN Interface Card, WIC-2T



Technical Specifications

Table 2-13 lists the technical specifications for the WIC-1T and WIC-2T cards.

Table 2-13 Technical Specifications for WIC-1T and WIC-2T Cards

Type	Description
Interface type	Serial
Serial network support	Synchronous, full duplex, half duplex, bisync
Physical connector	5-in-1 (60 pin) data terminal equipment (DTE) or data circuit-terminating equipment (DCE), depending on cable type

Table 2-13 Technical Specifications for WIC-1T and WIC-2T Cards (continued)

Type	Description
Number of connectors/ports	One (WIC-1T) Two (WIC-2T)
Cisco IOS requirement	11.3(2)XA or later
Compliance	FCC Class B device, CE
Safety conformance	UL1950
Spare	WIC-1T=

WIC-2A/S

The WIC-2A/S card is a two-port serial, low-speed (up to 128 kbps), asynchronous and synchronous interface card. (Externally, the WIC-2A/S is identical to the WIC-2T card; see Figure 2-13.)

Technical Specifications

Table 2-14 lists the technical specifications for the WIC-2A/S card.

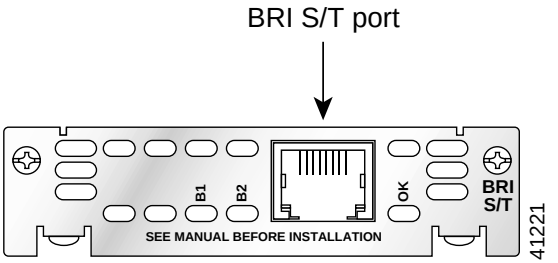
Table 2-14 Technical Specifications for WIC-2A/S Card

Type	Description
Interface type	Serial
Serial network support	Synchronous, asynchronous
Physical connector	Smart Serial DTE or DCE, depending on cable type
Number of connectors/ports	Two
Cisco IOS requirement	11.3(2)XA or later
Compliance	FCC Class B device, CE
Safety conformance	UL1950
Spare	WIC-2A/S=

WIC-1B-S/T

The WIC-1B-S/T card is a one-port ISDN BRI interface card (S/T interface). See Figure 2-14.

Figure 2-14 1-Port ISDN BRI WAN Interface Card (S/T Interface), WIC-1B-S/T



Technical Specifications

Table 2-15 lists the technical specifications for the WIC-1B-S/T card.

Table 2-15 Technical Specifications for WIC-1B-S/T Card

Type	Description
Interface type	ISDN BRI port
Interface	Two-wire user side S/T
Physical connector	RJ-48C
Number of connectors/ports	One
Cisco IOS requirement	11.3(2)XA or later
Compliance	FCC Class B device, CE
Safety conformance	UL1950
Spare	WIC-1B-S/T=

WIC-1B-U

The WIC-1B-U card is a one-port ISDN BRI interface card with integrated NT1 (U interface). (Externally, the WIC-1B-U is identical to the WIC-1T card; see Figure 2-12.)

Technical Specifications

Table 2-16 lists the technical specifications for the WIC-1B-U card.

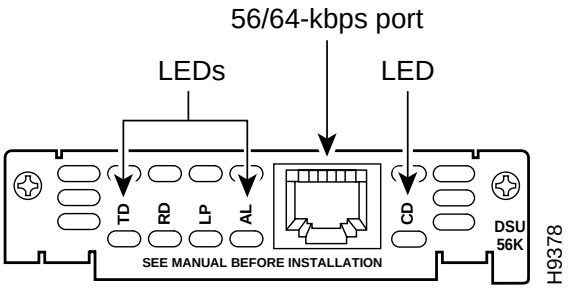
Table 2-16 Technical Specifications for WIC-1B-U Card

Type	Description
Interface type	ISDN BRI
Interface	U
Physical connector	RJ-45
Number of connectors/ports	One
Cisco IOS requirement	11.3(2)XA or later
Compliance	FCC Class B device, CE
Safety conformance	UL1950
Spare	WIC-1B-U=

WIC-1DSU-56K4

The WIC-1DSU-56K4 card is a single-port, four-wire 56-kbps CSU/DSU interface card (see Figure 2-15). Use the WIC-1DSU-56K4 card for an all-rate synchronous interface to any point-to-point or multipoint dedicated digital data service (DDS) network compatible with the AT&T Publication 62310 standard. The WIC-1DSU-56K4 card also supports four-wire switched 56-kbps data services, such as AT&T Accunet 56 or Sprint VPN-56, plus many switched data services offered by local exchange carriers.

Figure 2-15 One-Port 56-kbps CSU/DSU Card, WIC-1DSU-56K4



Technical Specifications

Table 2-17 lists the technical specifications for the WIC-1DSU-56K4 card.

Table 2-17 Technical Specifications for WIC-1DSU-56K4 Card

Type	Description
Interface type	Switched 56/64-kbps interface
Cisco IOS requirement	11.3(2)XAT or later
Serial network support	Synchronous, full duplex
Physical connector	RJ-45
Number of connectors/ports	One
Compliance	FCC Class B device, CE
Safety conformance	UL1950
Spare	WIC-1DSU-56K4=

WIC-1DSU-T1

The WIC-1DSU-T1 card is a single-port, T1/fractional T1 CSU/DSU interface card. Use the WIC-1DSU-T1 card for a cost effective router-CSU/DSU combination with the following features:

- T1 or fractional T1 network interface
- *N* x 64-kbps or *N* x 56-kbps non-channelized data rates (*N* = 1 to 24)
- Full management features:
  - Configuration: Capability for remote configuration via Telnet from the Cisco IOS CLI.
  - Monitoring: Router and CSU/DSU manageable as a single SNMP entity; extensive CSU/DSU statistics provided by the Cisco IOS CLI.
  - Troubleshooting: Extensive loopbacks (including a manual button for network line loopback), bit error rate tester (BERT) test patterns, alarm counters, and performance reports, all of which are accessible from the Cisco IOS CLI. LEDs for carrier detect, loopback, and alarm functions.

Technical Specifications

Table 2-18 lists the technical specifications for the WIC-1DSU-T1 card.

Table 2-18 Technical Specifications for WIC-1DSU-T1 Card

Type	Description
Interface type	T1 or fractional T1
Serial network support	Synchronous, full duplex
Physical connector	RJ-45
Number of connectors/ports	One
Cisco IOS requirement	11.3(4)T or later
Compliance	FCC Class B device, CE
Safety conformance	UL1950
Spare	WIC-1DSU-T1=

VWICs

This section describes the VWICS that are available for use in the MRP card and the ASI81 card:

- VWIC-1MFT-T1 and VWIC-2MFT-T1
- VWIC-1MFT-E1 and VWIC-2MFT-E1

VWIC-1MFT-T1 and VWIC-2MFT-T1

The VWIC-1MFT-T1 card is a one-port, RJ-48 multiflex trunk T1 interface card that supports 24 channels (see Figure 2-16). The VWIC-2MFT-T1 card is a two-port, RJ-48 multiflex trunk T1 interface card that supports 48 channels (see Figure 2-17). Use the cards for the following applications:

- Data: As a WIC for T1/fractional T1 applications. The card integrates a fully managed CSU/DSU.
- Packet voice: As a VIC for the Digital T1 Packet Voice Trunk Network Module to provide T1 connections to PBXs and central offices (COs), enabling new services and reducing voice/fax toll charges.
- Multiplexed voice/data: As a dual-port T1with integrated CSU/DSUs, reducing the complexity and number of network components and easing migration to bandwidth-efficient packet voice.

Configuration Guidelines

The following configuration guidelines apply to the VWIC-1MFT-T1 and VWIC-2MFT-T1 cards:

- Each MRP supports a maximum of two T1 spans.
- Each MRP supports a maximum of one T1 voice span.
- Each MRP supports a maximum of one T1 data span.
  - When one VWIC-1MFT-T1 card is used for data, it supports 24 simultaneous data connections.
  - When one VWIC-2MFT-T1 card is used for a T1 voice span, it can support up to 24 simultaneous voice connections.
- Each VWIC card supports a maximum of one channelized T1 group for data.

Figure 2-16 1-Port T1 Multiflex Trunk Interface Card, VWIC-1MFT-T1

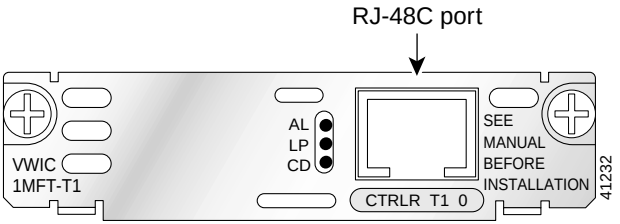
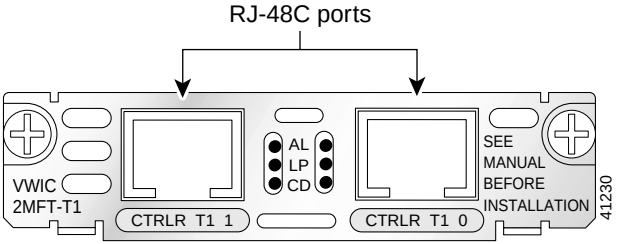


Figure 2-17 2-Port T1 Multiflex Trunk Interface Card, VWIC-2MFT-T1



Technical Specifications

Table 2-19 lists the technical specifications for the VWIC-1MFT-T1 and VWIC-2MFT-T1 cards.

Table 2-19 Technical Specifications for VWIC-1MFT-T1 and VWIC-2MFT-T1 Cards

Type	Description
Interface type	T1 or fractional T1
Transmit bit rate	1.544 Mbps +/–50 bps/32 PPM
Receive bit rate	1.544 Mbps +/–50 bps/32 PPM
Line code	AMI, B8ZS
AMI[1] ones density	Enforced for N x 56 kbps channels
Framing format	D4 Super Frame (SF) and Extended Superframe (ESF)

Table 2-19 Technical Specifications for VWIC-1MFT-T1 and VWIC-2MFT-T1 Cards (continued)

Type	Description
Output level (LBO)	0, –7.5, or –15 dB
Input level	+1 dB0 down to –24 dB0
DTE interface (WIC mode)	Fractional service
DTE interface (VIC mode)	G.704/structured
DCE interface	G.704/structured
Physical connector	RJ-48
Number of connectors/ports	• One (VWIC-1MFT-T1) • Two (VWIC-2MFT-T1)
Cisco IOS requirement	12.0(5)XK or later
Compliance	ANSI T1.403 ATT 54016 Bellcore—AT&T Accunet (62411) CS-03 FCC Part 68; FCC Part 15 Class B, T1 Canada (CSA 950, T1; CSA C108.8 Class A, T1) Japan (VCCI Class 2, VCCI:V-3/97.04, T1, JATE Green Book, IEC950) U.K. (BS6301, EN60950, EN41003)
Safety conformance	UL1950, T1
Spare	VWIC-1MFT1-T1=, VWIC-2MFT1-T1=

1. AMI = alternate mark inversion

VWIC-1MFT-E1 and VWIC-2MFT-E1

The VWIC-1MFT-E1 card is a one-port, RJ-48 multiflex trunk E1 interface card that supports 30 channels (see Figure 2-16). The VWIC-2MFT-E1 card is a two-port, RJ-48 multiflex trunk E1 interface card that supports 60 channels (see Figure 2-17).

Table 2-20 lists the technical specifications for the VWIC-1MFT-E1 and VWIC-2MFT-E1 cards.

Table 2-20 Technical Specifications for VWIC-1MFT-E1 and VWIC-2MFT-E1 Cards

Type	Description
Interface type	E1 or fractional E1
Transmit bit rate	2.048 Mbps +/– 100 bps/50 PPM
Receive bit rate	2.048 Mbps +/– 100 bps/50 PPM
Data rate	1.984 Mbps (framed mode) per E1 port
Clocking	Internal and loop (recovered from network)
E1 national bits	Software-configurable
Encoding	HDB3
DTE interface (WIC mode)	Fractional service
DTE interface (VIC mode)	G.704/structured
DCE interface	G.704/structured
Physical connector	RJ-48
Number of connectors/ports	• One (VWIC-1MFT-E1) • Two (VWIC-2MFT-E1)
Cisco IOS requirement	12.0(5)XK or later
Compliance	Australia (TS 016, AS/NZS 3548:1995) Europe (EN55022 Class B, EN55102-1, EN55102-2, CTR12, EN60950, EN50082-1:1992, EN55022:1994) France (NFC98020, EN60950, EN41003) Germany (TUV GS, EN60950; VDE 0878 part 3 and 30) Sweden (SS447-2-22, SS636334, EN60950) UK (NTR4) CCITT/ITU G.704, I.431 ETSI NET5, ETS300156 TBR4 CTR-13 ETS 300011 ITU I.431
Spare	VWIC-1MFT-E1=, VWIC-2MFT-E1=

Summary of Power and Cooling System Features

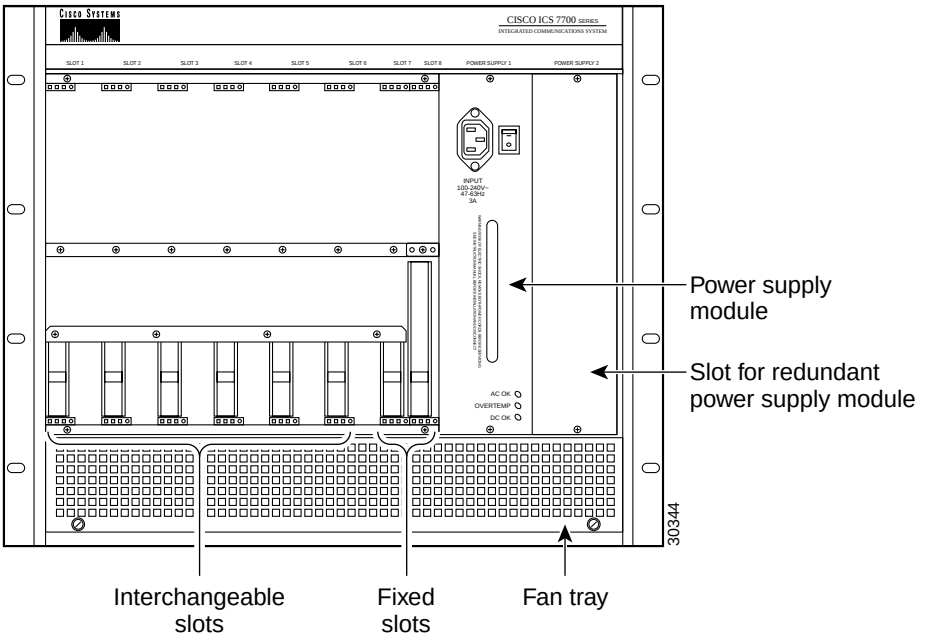
The Cisco ICS 7750 power and cooling system includes the following components:

- Cisco ICS 7750 Chassis, Backplane, and Fan Tray, page 3-1
- Power Supply Module, page 3-4
- Power Protection Component, page 3-7

Cisco ICS 7750 Chassis, Backplane, and Fan Tray

The Cisco ICS 7750 chassis is compact and designed for installation in a standard 19-inch rack or on a desktop. The backplane supports the standard 6U Eurocard form factor. The fan tray includes four fans to cool the cards and monitor the chassis temperature. The fan speed is controlled to accommodate a change in temperature. Figure 3-1 shows the Cisco ICS 7750 chassis with a power supply module installed.

Figure 3-1 Cisco ICS 7750 Chassis



Note The Federal Communications Commission (FCC) registration number of the Cisco ICS 7750 is 5B1USA-40188-MF-E. The FCC number is also written on the label affixed to the bottom of the chassis.

Key Features

The chassis, backplane, and fan tray have the following key features:

- Two fixed, single-wide slots for the system alarm processor (SAP) card and the system switch processor (SSP) card.
- Six interchangeable slots for system processing engine (SPE), multiservice route processor (MRP), and analog station interface (ASI) cards.
- Two slots for the power supply modules.
- Support for the standard 6U Eurocard form factor.

- All cards are hot-swappable.
- Hot-swappable fan tray, accessible from the front of the chassis.
- Fans are monitored and controlled through the SAP card.
- Grounding lug for grounding the chassis to the wall outlet, optionally including the uninterruptible power supply (UPS).

Technical Specifications

Table 3-1 lists the technical specifications for the Cisco ICS 7750 chassis.

Table 3-1 Chassis Technical Specifications

Type	Description
Dimensions	Height: 15.75 in. (40.005 cm) Width: 17.25 in. (43.815 cm) Depth: 12.5 in. (31.75 cm)
Weight	42 lb (18.9 kg) with 1 MRP, 1 SPE, 1 SSP, 1 SAP (4 cards total), and 1 power supply installed
Power requirements	100 to 240V 47 to 63 Hz 3A
Power dissipation	275W maximum
UPS	Input voltage: 93 to 132 VAC Frequency: 47 to 63 Hz Output: 1050W/1400 VA Run time: 8 minutes minimum Optional external battery pack: approximately 30 minutes run time each
Acoustic noise	Operating: 48 dBA maximum
Temperature	Operating: 32 to 104ºF (0 to 40ºC) Nonoperating: –4 to 149ºF (–20 to 65ºC)
Relative humidity	Operating: 10 to 85% Nonoperating: 5 to 95%
Altitude	Operating: 10,000 ft (3000 m) Nonoperating: 15,000 ft (4570 m)

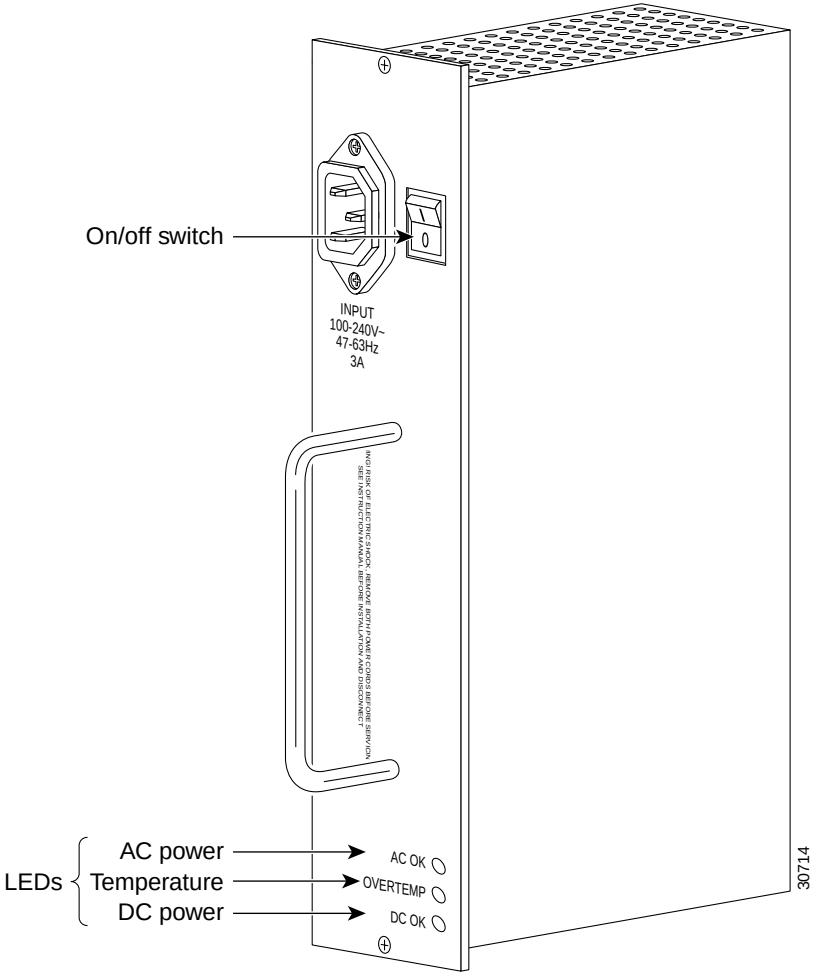
Table 3-1 Chassis Technical Specifications (continued)

Type	Description
Shock	Operating: up to 27 in. per second (0.69 m per second) Nonoperating: up to 35 G
Vibration	0.35 Grms from 3 to 500 Hz
Safety	UL 1950, Third Edition CAN/CSA 22.2 No. 950-95, Third Edition
Emissions	CFR 47 part 15:1998 (Class A, radiated and conducted emission)
Standards	FCC Part 68 CS-03
Mounting options	• 19-in. rack • Standalone (desktop)

Power Supply Module

The Cisco ICS 7750 chassis has two slots for power supply modules. At least one power supply module is required; a second power supply module can be added for redundant power. With two power supply modules, one module acts as the primary power supply, and the other power supply is a backup in case the primary fails. Only one module supplies power to the system at any time. Figure 3-2 shows the power supply module.

Figure 3-2 Power Supply Module



Key Features

The power supply module has the following key features:

- Automatic remote enable/disable signal: Ensures that the power supply remains off until fully seated and turns the power supply off during removal.
- Operates as a single or redundant module.
- Hot-swappable, accessible from the front of the chassis.
- Current sharing when two power supplies reside in a chassis (the power supplies do not load share).
- Four DC voltage outputs: +3.3V, +5V, +12V, and –12V.
- AC input range of operation: 100 to 240 VAC.
- IEC 320-C14 AC input receptacle.
- Overvoltage protection: Power supply shuts down if the power output exceeds the nominal output by 120 percent.
- Automatic thermal shutdown: If the ambient temperature is too high, the power supply shuts down automatically; when the ambient temperature returns to a safe operating range, the power supply restarts automatically.
- Automatic redundancy when two power supplies are installed.

Technical Specifications

Table 3-2 lists the technical specifications for the power supply module.

Table 3-2 Technical Specifications for Power Supply Module

Type	Description
Dimensions and weight	10 lb (4.5 kg)
Temperature	Operating: 23 to 113ºF (–5 to 45ºC) Nonoperating: –40 to 185ºF (–40 to 85ºC)
Relative humidity	Operating: 10 to 90% (noncondensing) Nonoperating: 10 to 95% (noncondensing)
Thermal shock	Operating: –5 to 45ºC, 0.5ºC/minute Nonoperating: –40 to 85ºC, changeover time between 2 and 3 minutes

Table 3-2 Technical Specifications for Power Supply Module (continued)

Type	Description
Altitude	Operating: Up to 10,000 ft (3,000 m) Nonoperating: Up to 15,000 ft (4,570 m)
Vibration	Operating: 0.41 Grms from 3 to 500 Hz with spectral break points of 0.0005 G2/Hz at 10 Hz and 200 Hz and 5 dB/octave roll-off at each end, 2 hours per axis Nonoperating: 1.12 Grms from 3 to 500 Hz with spectral break points of 0.0065 G2/Hz at 10 Hz and 200 Hz and 5 dB/octave roll-off at each end, 30 minutes per axis

Power Protection Component

For complete power protection for the Cisco ICS 7750 system, a UPS is available for the Cisco ICS 7750 chassis. The Cisco redundant power system (RPS) 300 is available for the Catalyst switches that are connected to the Cisco ICS 7750.

Uninterruptible Power Supply

A UPS is an external device that maintains power to the system if the power supply fails. The appropriate UPS for the Cisco ICS 7750 is the APC Smart-UPS, manufactured by American Power Conversion (APC) Company. The APC Smart-UPS has the following features:

- It prevents blackouts, brownouts, sags, and surges from reaching the Cisco ICS 7750.
- It filters small utility line fluctuations.
- When large power disturbances occur, it internally disconnects from the utility line and supplies power from its internal batteries, returning to the utility line only when a safe level of power is restored.

- It provides power to the Cisco ICS 7750 and Catalyst switches during power disturbances.
- When connected to a serial port on the SAP card, the UPS can be monitored for alarms.
- Using the inline power feature, Catalyst switches that are protected by a UPS provide power to the IP Phones, which are then unaffected by power disturbances.

A UPS has battery power that keeps equipment running for a certain period of time. Up to five battery packs can be added to a UPS for additional power. Also, the UPS can be configured to handle Simple Network Management Protocol (SNMP) management, remote monitoring, and alarm reporting.

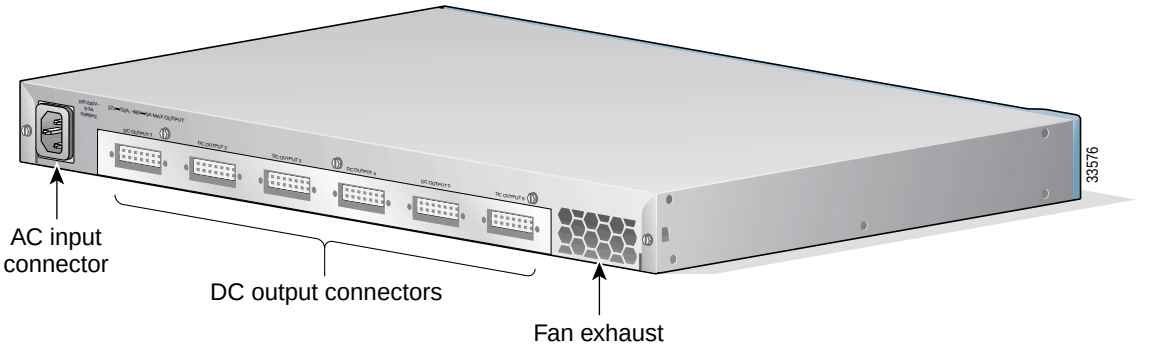
The UPS can handle a maximum load of up to 1400 VA (1050W) for all equipment that is connected to it. For information on the APC Smart-UPS, refer to the user manual that comes with the APC UPS.

Cisco RPS 300

The Cisco RPS 300 provides a fully redundant power source connection for up to six Catalyst switches (see Chapter 7, "Features of LAN-Based Switching Technologies," for additional information about compatible switches). When a power failure occurs in one of the switches, the RPS 300 automatically supplies power to the switch. The RPS 300 can power only one switch at a time. For complete redundancy, you should connect each switch in the Cisco ICS 7750 to a separate RPS 300.

The RPS 300 has one AC input power connector and six DC power output connectors. Figure 3-3 shows the back panel of the Cisco RPS 300.

Figure 3-3 Back Panel of Cisco RPS 300



Feature Summary

The RPS 300 has the following key features:

- Redundant support for the Catalyst 3524-PWR-XL switch
- Provides a redundant power connection for up to six switches, powering one switch at a time
- One AC input power connector
- Six 300W DC output power connectors
- SNMP support of error messages

Technical Specifications

Table 3-3 lists the technical specifications for the RPS 300.

Table 3-3 Technical Specifications for RPS 300

Type	Description
Dimensions	Height: 1.75 in. (4.45 cm) Width: 17.5 in. (44.45 cm) Depth: 12 in. (30.48 cm)
Weight	10.5 lb (4.7 kg)

Table 3-3 Technical Specifications for RPS 300 (continued)

Type	Description
Temperature	Operating: 32 to 113ºF (0 to 45ºC) Nonoperating: –4 to 149ºF (–20 to 65ºC)
Relative humidity	Operating: 10 to 85% (noncondensing) Nonoperating: 5 to 95% (noncondensing)
Altitude	Operating: Up to 10,000 ft (3,000 m) Nonoperating: Up to 15,000 ft (4,570 m)
AC input voltage	85 to 264 VAC 50 to 60 Hz
Power consumption	Total: 144W per 48 VDC output and 156W per 12 VDC output Maximum for both outputs: 300W, continuous Per channel: 156W per channel maximum
Safety	UL 1950/CSA 22.2 No. 950 IEC 950/EN 60950 AS/NZS 3260, TS001 CCEE
EMI	FCC Part 15 Class A EN 55022 Class A VCCI Class A AS/NZS 3548 Class A CE BSMI CCIB approval pending NOM approval pending

Summary of System Software Features

The chapter describes the required system software that runs on Cisco ICS 7750 cards and includes these sections:

- ICSConfig Program, page 4-3
- Cisco ICS System Manager, page 4-5
- Fault Management Module, page 4-8
- Cisco IOS, page 4-9
- Cisco CallManager, page 4-13

System software for the Cisco ICS 7750 is distributed in packaged system software bundles. Six software bundles are available, which contain different Cisco IOS feature sets (see the "Cisco IOS" section on page 4-9).

Table 4-1 summarizes the software that runs on system cards.

Table 4-1 Summary of System Software Applications

Software	Platform	Description
ICSConfig Program	System processing engine (SPE) card (running System Manager)	Provides a wizard-based configuration program for setting up the basic system data at system startup.
ICS System Manager	SPE card (runs on one SPE per chassis)	Provides integrated web-based management of voice and data components with an easy-to-use graphical user interface for operations, administration, and management.
Fault Management Module	SPE cards	Installed with ICS Core Software on SPE cards (other than the SPE running System Manager) to act as the back end for advanced fault management, availability notification, and reporting mechanisms.
Cisco IOS	Multiservice routing processor (MRP), analog station interface (ASI), and MRP300 cards	Provides multiprotocol routing (IP, Internetwork Packet Exchange [IPX], and AppleTalk), IBM/Systems Network Architecture (SNA), and transparent bridging over ISDN, asynchronous serial, and synchronous serial such as leased lines, Frame Relay, Switched Multimegabit Data Service (SMDS), Switched 56, X.25, and X.25 over D, and WAN optimization. Includes dial-on-demand routing (DDR), bandwidth-on-demand (BOD) and Open Shortest Path First (OSPF)-on-demand circuit, snapshot routing, compression, and filtering.

Table 4-1 Summary of System Software Applications (continued)

Software	Platform	Description
	System switch processor (SSP) card	Provides unified monitoring, configuration, and authentication of interconnected switches through a web-based interface. Offers management redundancy supported by the Hot Standby Router Protocol (HSRP), support for IEEE 802.1p class of service (CoS) for classification and preferential treatment of high-priority traffic. Manages network security through the Terminal Access Controller Access Control System Plus (TACACS+) feature.
Cisco CallManager	SPE cards	Enables a telephony network consisting of IP terminals, gateways, and voice applications. Provides signaling and call control services to Cisco integrated multimedia applications, as well as third-party applications.

ICSConfig Program

The ICSConfig program is a component that is installed on the SPE running System Manager. When the Cisco ICS 7750 is started for the first time, the system must collect certain configuration information to communicate with the network. ICSConfig runs a discovery routine that identifies all the cards and the software installed on the cards. If the discovery routine finds errors, it displays error messages. The discovery stage must finish without any errors before the configuration stage can begin.

The web-based ICSConfig program enables the installer to enter system setup and network information, including the following:

- IP address information for the systems cards installed in the ICS 7750 chassis
- Network and Dynamic Host Configuration Program (DHCP) information for IP phones and other network devices
- Domain Name Server (DNS) and gateway information

- Security settings for the following:
  - IOS-based cards
  - SNMP
  - The SPE
  - The system
- Preferences for managing system event notifications

Figure 4-1 shows the type of information that ICSConfig collects to integrate the Cisco ICS 7750 with the network.

Figure 4-1 ICS 7700 System Configuration for the Cisco ICS 7750 System

Cisco ICS System Manager

Cisco ICS System Manager provides a suite of tools to manage an integrated data and voice network. From a centralized, web-based user interface, the network administrator can use these tools for the following tasks:

- Preventive fault management
- Performance monitoring
- Real-time reporting
- Cisco IOS image management
- Access-level security for the Cisco ICS 7750
- System inventory monitoring (as shown in Figure 4-2)

Figure 4-2 ICS System Manager Home Page

By using a browser on any PC connected to the LAN, the administrator can access the System Manager Configuration page, as shown in Figure 4-3, to set up and to manage the following system components:

- SSP—For switched fast Ethernet settings to access other system components
- System parameters—For network communication settings that were set up with the ICSConfig program
- Fan—For viewing and updating system fan life
- COM ports—For viewing and changing SAP non-console ports
- Applications—For accessing to Cisco CallManager and Cisco Unity administration

Figure 4-3 Cisco ICS System Manager Configure Page

ICS 7700 System Manager - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://11.0.0.126/ics/wcmmainframe.asp
ICS System Manager
Configure
Select SSP Manager to configure the system switch processor and perform local area network management tasks, such as administering workgroup changes and using link statistics to troubleshoot problems.
Select System Setup to view ICS 7700 system parameters and obtain instructions on how to change them.
Select Fan Manager to view and update system fan life monitoring dates.
Select COM Port Manager to view and change Non Console Port Assignment
Select Applications to configure the applications installed on the SPEs in the chassis
74836

Key Features

ICS System Manager has the following key features:

- Configuration—A single web interface allows network administrators to configure many system components, such as the SSP. (To configure IP phones and voice gateways, use Cisco CallManager.).
- Monitoring—Administrators can remotely monitor systems through ICS System Manager and can view data in real time.
- Event management—ICS System Manager includes advanced event management features and provides a single view into system-wide syslog messages and Simple Network Management Protocol (SNMP) traps. Administrators can create customized reports on historical events, and they can create site-specific event-notification rules.
- Software upgrade—Administrators can use ICS System Manager for remotely managing Cisco IOS images on the Cisco ICS 7750 and remotely upgrading specific system cards in a chassis. A library of Cisco IOS images can be maintained on the Cisco ICS 7750 for archiving or for later use.
- Security—ICS System Manager provides seven access profiles for the Cisco ICS 7750; these profiles allow multiple remote administrators with different security or expertise levels to work on a system simultaneously.
- Advanced configuration—Cisco IOS experts can use the command-line interface (CLI) to configure any of the Cisco ICS 7750 IOS-based cards.
- Centralized management—ICS System Manager supports SNMP, so that administrators can use existing network management applications such as CiscoWorks2000.
- Remote access—ICS System Manager supports Integrated Virtual Private Network (VPN) and Firewall features for highly secure remote access.
- Logs and records—ICS System Manager stores the following system information in a Microsoft SQL database:
  - Syslogs
  - Information about inventory and user accounts
  - Image information for cards

Technical Specifications

Table 4-2 lists the technical specifications for ICS System Manager.

Table 4-2 Technical Specifications for ICS System Manager

Type	Description
Hardware	Runs on one SPE310[1]
Database software	Microsoft SQL 7.0
Client PC hardware	Minimum requirements: 233-MHz CPU 64 MB of RAM CD-ROM drive VGA monitor with 640 x 480 pixel display and 256 colors
Client operating system	Windows 98 Windows NT 4.0 Windows 2000 Windows Me Windows XP
Web browsers	Microsoft Internet Explorer version 5.01 or later Netscape Navigator version 4.7 or later

1. To run system software release 2.0.0, you must replace SPE200s with SPE310s, and you cannot install SPE 310s in a chassis that has SPE200s.

Fault Management Module

The Fault Management Module (FMM) is a software module that runs as a service with Windows 2000. FMM starts as part of the system initialization. As the master service on the Cisco ICS 7750, FMM is responsible for starting up, shutting down, monitoring, and coordinating the activity of the other software modules on the SPE care. It performs these functions:

- Constantly communicates with ICS System Manager and if communication with a software module is lost, the FMM attempts to correct the error by restarting a card or the system, if necessary
- Provides fault detection and recovery mechanisms in the Cisco ICS 7750

- Enables ICS System Manager to monitor the SPE and system alarm processor (SAP) cards and the chassis
- Determines the current status of the SPE on which it is running

The SAP card is responsible for reporting environmental and physical problems to the FMM. The FMM can detect the following faults:

- Ambient temperature and card temperature above threshold (40ºC)
- Fan failure
- Redundant power supply failure
- Power failure (if a UPS is available)
- Software module failure (such as ICS System Manager)
- Chassis card failure

When an error occurs, the FMM notifies the ICS System Manager.
ICS System Manager then reports problems on the logical layer in the form of SNMP traps.

FMM can attempt to correct a problem by

- Recovering from hot-swapping any card except the SPE running System Manager
- Sending syslog messages and updating the shared SPE memory
- Turning on or off the status LED on the SPE

In response to FMM notifications, System Manager can

- Turn on or off the status LED on any card
- Send an e-mail or page alert to an administrator when an alarm condition is present

Cisco IOS

Cisco IOS software is packaged in feature sets consisting of software images, which are specific to the platforms. Each feature set contains a specific set of Cisco IOS features. Table 4-3 lists the feature sets supported by the Cisco ICS 7750 on MRP and ASI cards.

Table 4-3 Feature Sets Supported by the Cisco ICS 7750 on MRP and ASI Cards

Image Name	Feature Set Matrix Terms	Software Image
Cisco 7700 IOS IP, Voice, Plus	IP/Voice Plus	ics7700-sv3y-mz
Cisco 7700 IOS IP, IPX, AT, IBM, Voice, Plus	IP/IPX/AT/IBM/Voice Plus	ics7700-bnr2sv3y-mz

Table 4-4 lists some of the features and feature sets supported by MRP cards and ASI cards (as of IOS Release 12.2(4)YH). Table 4-4 uses the following conventions:

- Yes—The feature is supported in the software image.
- No—The feature is not supported in the software image.

Note This feature set table contains only a selected list of features; it does not list all the features in each image. For the complete list of features for the latest IOS Releases, use the Feature Navigator at this URL: http://www.cisco.com/cgi-bin/Support/FeatureNav/FN.pl

Table 4-4 Feature List, by Feature Set, for MRP and ASI Cards

Features	Feature Sets					
	IP/ Voice Plus	IP/FW[1]/ Voice Plus IPSec[2] 56	IP/FW/ Voice Plus IPSec 3DES[3]	IP/IPX[4]/AT/ IBM/FW/ Voice Plus	IP/IPX/AT/ IBM/ Voice Plus IPSec 56	IP/IPX/AT/ IBM/FW/ Voice Plus IPSec 3DES
Connectivity						
Layer 2 Tunneling Protocol (L2TP) Dial-Out	Yes	Yes	Yes	Yes	Yes	Yes
IP Multicast						
Bidirectional Protocol Independent Multicast (PIM)	Yes	Yes	Yes	Yes	Yes	Yes

Table 4-4 Feature List, by Feature Set, for MRP and ASI Cards (continued)

Features	Feature Sets					
	IP/ Voice Plus	IP/FW[1]/ Voice Plus IPSec[2] 56	IP/FW/ Voice Plus IPSec 3DES[3]	IP/IPX[4]/AT/ IBM/FW/ Voice Plus	IP/IPX/AT/ IBM/ Voice Plus IPSec 56	IP/IPX/AT/ IBM/FW/ Voice Plus IPSec 3DES
IP Routing Protocols						
Open Shortest Path First (OSPF) Flooding Reduction	Yes	Yes	Yes	Yes	Yes	Yes
Multimedia and Quality of Service						
Express Real-time Transport Protocol(RTP) Transmission Control Protocol (TCP) Header Compression	Yes	Yes	Yes	Yes	Yes	Yes
IP to Asynchronous Transfer Protocol (ATM) CoS	Yes	Yes	Yes	Yes	Yes	Yes
PIM Version 2	Yes	Yes	Yes	Yes	Yes	Yes
Security						
Cisco IOS Firewall Feature Set	No	Yes	Yes	Yes	No	Yes
Secure Shell (SSH) Version Integrated Client	No	Yes	Yes	Yes	No	Yes
SSH Version 1 Server Support	Yes	Yes	Yes	Yes	Yes	Yes
Triple DES Encryption for IPSec	No	No	Yes	No	No	Yes
Virtual Private Network (VPN) Module	Yes	Yes	Yes	Yes	Yes	Yes

Table 4-4 Feature List, by Feature Set, for MRP and ASI Cards (continued)

Features	Feature Sets					
	IP/ Voice Plus	IP/FW[1]/ Voice Plus IPSec[2] 56	IP/FW/ Voice Plus IPSec 3DES[3]	IP/IPX[4]/AT/ IBM/FW/ Voice Plus	IP/IPX/AT/ IBM/ Voice Plus IPSec 56	IP/IPX/AT/ IBM/FW/ Voice Plus IPSec 3DES
Switching						
Web Cache Communications Protocol (WCCP) Version 2	Yes	Yes	Yes	Yes	Yes	Yes
WAN Optimization						
Class-Based Weighted Fair Queuing	Yes	Yes	Yes	Yes	Yes	Yes
Low Latency Queuing	Yes	Yes	Yes	Yes	Yes	Yes
WAN Services						
1- and 2-Port T1 Multiflex Voice WAN Interface Cards (VWICs)	Yes	Yes	Yes	Yes	Yes	Yes
Frame Relay Switching Enhancements: Shaping and Policing	Yes	Yes	Yes	Yes	Yes	Yes
Data Link Switching Plus (DLSw+) Enhancements	No	No	No	No	Yes	Yes
DLSw+ Resource Reservation Protocol (RSVP)	No	No	No	No	Yes	Yes
Microsoft Point-to-Point Compression (MPPC-MS)	Yes	Yes	Yes	Yes	Yes	Yes

1. Firewall
2. IPSec = IP Security
3. 3DES = Triple Data Encryption Standard
4. IPX = Internetwork Packet Exchange

The following features are supported on the SSP card in IOS Release 12.0(5)WC5:

- 8192 Media Access Control (MAC) addresses on modular switches
- Catalyst 2900 series XL 1000BASEX modules
- Catalyst 2900 series XL ATM modules
- Catalyst 3500 series XL switches
- Fast EtherChannel port groups
- Hot Standby Router Protocol (HSRP)
- IEEE 802.1Q trunking
- Inter-Switch Link (ISL) trunking
- Network Time Protocol (NTP)
- Quality of service (QoS) based on IEEE 802.1p CoS values
- Remote Monitoring (RMON) support through the CLI or SNMP
- Spanning-Tree Protocol (STP) UplinkFast
- Switch Network View stack management
- Terminal Access Control Access Server+ (TACACS+)
- UniDirectional Link Detection (UDLD) for detecting unidirectional links
- Web-based switch management

Cisco CallManager

Cisco CallManager is a software-only call-processing application that you can install on SPE cards. Cisco CallManager extends enterprise telephony features and functions to packet telephony network devices such as IP phones, media processing devices, VoIP gateways, and multimedia applications.

The Cisco ICS 7750 supports “native” Cisco CallManager functionality by using the feature set that is available on other Cisco CallManager platforms.

You can install Cisco CallManager on any SPE, including the SPE running System Manager. Cisco CallManager can function as either a publisher or a subscriber on any SPE.

Cisco CallManager can operate in a cluster with other Cisco CallManager servers that are installed in the following configurations:

- On another SPE in the same Cisco ICS 7750
- On another SPE in a different Cisco ICS 7750
- On any other server platform supported by Cisco CallManager (such as the Cisco Media Convergence Server (MCS) product family)

Additional data and voice services, such as voice messaging, multimedia conferencing, collaborative contact centers, and interactive multimedia response systems, interact through Cisco CallManager open telephony application program interface (API). The API supports these applications on the Cisco ICS 7750:

- Cisco Unity Voice Messaging
- IP Integrated Contact Distribution (IP ICD)
- IP Interactive Voice Response (IP IVR)

Cisco CallManager provides signaling and call control services to Cisco integrated telephony applications as well as third-party applications. It performs the following primary functions:

- Call processing
- Signaling and device control
- Dial plan administration
- Phone feature administration
- Directory services using Light Directory Access Protocol (LDAP)
- Operations, administration, management, and provisioning (OAM&P)
- Programming interface to external voice-processing applications such as Cisco SoftPhone, Cisco IP IVR, Cisco Personal Assistant, and Cisco Attendant Console

Key Features

Cisco CallManager is the call-processing component of the Cisco IP Telephony Solution for the Enterprise part of Cisco AVVID (Architecture for Voice, Video and Integrated Data). The Cisco IP Telephony Applications Server provides a high-availability server platform for Cisco CallManager call processing, services, and applications.

Cisco CallManager supports a growing list of features in the following categories:

- User features
- Administrative features
- Third-party applications
- Cisco applications

For a complete list of features for the latest release of Cisco CallManager, refer to the product information at:

http://www.cisco.com/univercd/cc/td/doc/pcat/clmn32.htm#CHDDGCFJ

Table 4-5 describes key features of Cisco CallManager.

Table 4-5 Key Features of Cisco CallManager

Feature	Description
Software suite of integrated voice applications	Provides functions such as voice conferencing and manual attendant console without special-purpose voice-processing hardware. Enhancing its capabilities at a customer location requires upgrading software on the server platform, thereby avoiding expensive hardware upgrade costs.
Distributed architecture across an IP network	Improves system availability and scalability of Cisco CallManager servers and all Cisco IP phones, gateways, and applications.
Call admission control	Ensures that voice QoS is maintained across constricted WAN links and automatically diverts calls to alternate Public Switched Telephone Network (PSTN) routes when WAN bandwidth is not available.

Table 4-5 Key Features of Cisco CallManager (continued)

Feature	Description
System administration	Use a web-based interface to the configuration database that permits remote device and system configuration. Provides access to HTML-based online help for users and administrators.
System administration tools	The Bulk Administration Tool (BAT) automates adding, updating, or deleting phones, users, and devices on the Cisco CallManager database. The Administrative Reporting Tool (ART) generates the following reports that provide information about voice quality and gateway performance. • Quality of service • Traffic details • User call details • Billing details • Gateway details • Call Detail Records
Cisco CallManager Serviceability	Provides the following services for troubleshooting problems: Alarms—Saves Cisco CallManager services alarms and events for troubleshooting and provides alarm message definitions. Trace—Saves Cisco CallManager services trace information to log files for troubleshooting. Administrators can configure, collect, and analyze trace information. Admin Serviceability Tool—Monitors real-time behavior of the components in a Cisco CallManager cluster. Control Center—Views status of Cisco CallManager services. Administrators use Control Center to start and stop services.

System Capabilities

The following is a summary of Cisco CallManager system capabilities:

- Call routing using Alternate Automatic Routing (AAR), Automated Route Selection (ARS), and automated bandwidth selection
- Attenuation/gain adjustment per device, comfort noise generation, silence suppression, and voice activity detection
- Codec support for automated bandwidth selection
- Digit analysis and call treatment, outbound call blocking
- Unified dial plan, dial plan partitioning for multi-tenants and toll restriction
- Distributed call processing
- H.323 interface to selected devices and interface to H.323 gatekeeper for call admission control
- Hot line and private line, automated ringdown (PLAR)
- Off-premises station (OPX)
- Music on Hold (MOH)
- Hunt groups
- Out-of-band dual tone multifrequency (DTMF) signaling over IP
- Redundancy and automated failover on call-processing failure
- Survivable Remote Site Telephony (SRST)
- Shared resource/application management and configuration for transcoder, conference bridge
- Simplified North American Numbering Plan (NANP) and non-NANP support
- Third-party applications that support the following:
  - Broadcast paging—through Foreign Exchange Station (FXS)
  - SMDI for message waiting indication
  - Hook-flash support on selected FXS gateways
  - TAPI 2.1 (Telephony Applications Programing Interface) service provider (TSP) interface

- JTAPI 1.2 (Java Telephony Application Programing Interface) service provider interface
- Billing and call statistics

Specifications

Table 4-6 lists the specifications for Cisco CallManager.

Table 4-6 Specifications for Cisco CallManager on the Cisco ICS 7750

Type	Description
Hardware platform	Runs on the SPE310[1]
System software	Requires Cisco ICS 7750 system software release 2.1.0 or later
Applications software	Cisco CallManager Release 3.1(2c) or later
Client PC hardware	Minimum requirements: 233-MHz CPU 64 MB of RAM CD-ROM drive VGA monitor with 640 x 480 pixel display and 256 colors
Client operating system	Windows 98 Windows NT 4.0 Windows 2000 Windows Me
Web browsers	Microsoft Internet Explorer version 5.01 or later Netscape Navigator version 4.7 or later

1. To run system software release 2.1.0, you must replace SPE200s with SPE310s, and you cannot install SPE310s in a chassis that has SPE200s.

Summary of Software Applications Features

The chapter describes the optional software applications that run internally on Cisco ICS 7750 cards or externally on servers or other devices:

- Internal Software Applications, page 5-1
- External Software Applications, page 5-22

Internal Software Applications

The following software can run on the system processing engine (SPE) 310 and interoperate with the Cisco ICS 7750:

- Cisco CallManger Extended Services, page 5-2
- Cisco Unity Voice Messaging, page 5-6
- Cisco Customer Response Applications, page 5-14

Cisco CallManger Extended Services

Cisco CallManager Extended Services comes bundled with Cisco CallManager, Release 3.1 or higher. By using Customer Response Application (CRA) technology, Cisco CallManger Extended Services runs preconfigured application scripts to provide these two application solutions:

- Cisco CallManager Extension Mobility
- Cisco CallManager Auto Attendant

Cisco CallManager Extension Mobility

Cisco CallManager Extension Mobility allows users within a Cisco CallManager cluster to temporarily configure any Cisco IP Phone 7960/7940 as their own phone. The phone adopts the user's personal phone number(s), speed dials, services links, and other user-specific properties after the user logs in to the phone terminal. When the user logs out, the phone returns to the original user profile.

With Cisco CallManager Extension Mobility, several employees can share office space on a rotational basis instead of having a designated office. Office-sharing is commonly used in work environments such as sales offices and consulting firms in which employees conduct business in different locations or work during different hours of the day.

Login Service

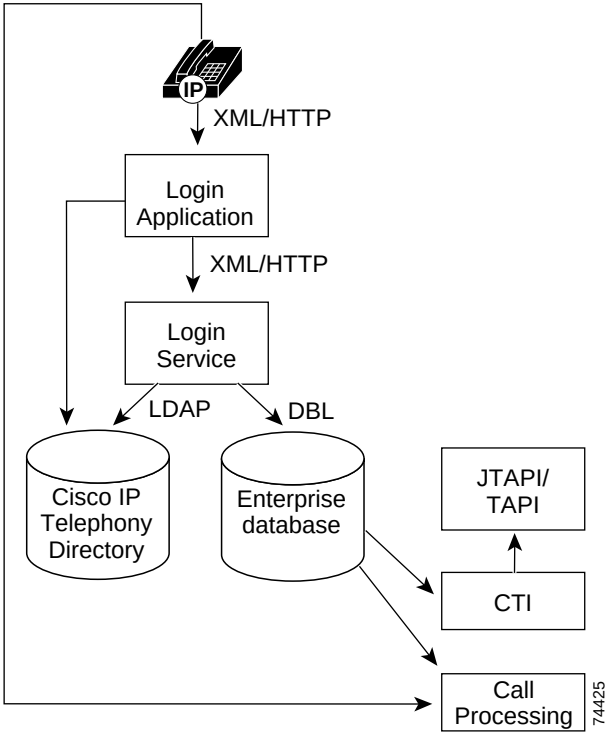
Administrators can program the login service, an Extensible Markup Language (XML)–based authentication service for specific phones, and can set duration limits on phone configuration. Programming is done by using the Cisco CallManager Service Parameters Configuration.

The user accesses the login interface by using the Services button on Cisco IP Phone Models 7960 or 7940. The user enters a user ID and a personal identification number (PIN). The Login Application receives the XML-over-HTTP request and verifies the information against the Cisco IP Telephony Directory (see Figure 5-1 on page 5-3). The phone is reconfigured automatically with the individual user device profile information.

Logout Service

The user logs out by pressing the Services button and selecting **Logout**. After the user logs out, Cisco CallManager sends the original user profile to the phone and restarts the phone.

Figure 5-1 Cisco CallManager Extension Mobility Architecture



Cisco CallManager Auto Attendant

To direct incoming calls to an organization, Cisco CallManager Auto Attendant (Cisco CallManager AA) automatically answers calls with a recorded greeting and gives callers options for directing their call.

The Cisco CallManager AA provides the following functionality:

- Answers a call
- Plays a user-configurable Welcome prompt
- Plays a Main Menu prompt that asks the user to perform one of three actions:
  - Press “0” for the operator
  - Press “1” to enter an extension number
  - Press “2” to spell by name

If a caller chooses to enter an extension number, the system searches the Cisco CallManger configured devices for the number. If there is a match, the system transfers the call to that extension.

If the caller chooses to spell by name, the system compares the letters entered with the names configured in the Cisco CallManager Users database.

- If there is a match, the system prompts the user for confirmation of the name and transfers the call to that user's primary extension.
- If there are more than one match, the system prompts the user to select the correct extension.
- If there are too many matches, the system prompts the user to enter more characters. When the caller selects the destination, the system transfers the call.

If the line is busy or not in service, the system informs the user accordingly and replays the Main Menu prompt.

Note Cisco CallManager AA provides the automated attendant function for systems without Cisco Unity Voice Messaging. Cisco Unity Voice Messaging has an automated attendant function that provides more flexibility.

Key Features

Cisco CallManager Extended Services solution applications have the key features described in Table 5-1.

Table 5-1 Components of Cisco CallManager Extended Services

Application	Key Function	Key Benefit
Cisco CallManager Extension Mobility	Provides temporary configuration of a Cisco IP phone with a user profile	Users can log in to an available Cisco IP Phone 7960 or 7940 that has been set up with the Extension Mobility service. Users temporarily have access to their personal extension(s), speed dial numbers, and services. Several employees can share the same office space for cost-effective use of resources for sales offices or shift employees. System administrators use Cisco CallManager Administration to set up this feature on specific phones.
Cisco CallManager Auto Attendant	Automatically answers and directs incoming calls	Callers hear a company greeting, which can be changed easily. Callers can choose how to direct their call from a menu of options. Callers can transfer to any user's phone by entering an extension number or name that is configured in the Cisco CallManager cluster. Callers can transfer to the operator for personal assistance. Calls to the operator are reduced, and call management is faster.

Specifications

Table 5-2 gives the specifications for Cisco CallManager Extended Service.

Table 5-2 Specifications for Cisco CallManager Extended Services

Type	Description
Software Package	Included with Cisco CallManager 3.1 and higher. Install by using the Cisco CallManager Extended Services CD.
Software Platform	Cisco Customer Response Applications (CRA) Engine and preconfigured scripts.
Administration	Cisco CallManager Administration is used to set up the applications.

Cisco Unity Voice Messaging

Cisco Unity Voice Messaging offers standalone or networked voice mail to enterprise-scale organizations. Voice messages are stored on an SPE card in the Cisco ICS 7750. Voice-messaging capabilities include automated attendant functionality, intelligent routing, and customizable call screening and message notification options.

Cisco Unity Voice Messaging is a component of the Cisco Architecture for Integrated Voice, Video, and Data (AVVID). Cisco Unity Voice Messaging is fully integrated with Cisco CallManager.

Components

Cisco Unity Voice Messaging includes the components identified in Table 5-3.

Table 5-3 Components of Cisco Unity Voice Messaging

Application	Key Function	Key Benefit
Intelligent Voice Mail	Receives and stores voice messages	Provides customizable settings and call-handling options. Allows multiple message delivery options and notification methods. Supports multiple personal greetings. Supports multilingual prompts in ten languages.
ActiveAssistant	Browser-based administration interface for users	Users can set up their own mailbox greetings, passwords, message notification destinations, transfer settings, and playback options. Users can change all mailbox functions from any desktop PC by using one URL. System administrators control user access to this feature.
Automated Attendant	Electronic receptionist for answering and directing incoming calls	Unlimited menu trees allow versatile options for callers. Call routing can be based on Caller ID, Dialed Number Identification Service (DNIS), Direct Inward Dialing (DID), trunk, port, and schedules. Reduces calls to the operator and speeds up call management.
Visual Messaging Interface	Web-based interface for accessing voice messages	Provides access to voice messages by using Internet Explorer and a LAN connection. Can listen to, reply to, compose, forward, and delete voice messages when using a PC.

Table 5-3 Components of Cisco Unity Voice Messaging (continued)

Application	Key Function	Key Benefit
Digital Networking	Connects multiple Cisco Unity servers	Provides a seamless voice-messaging system across an organization. Can forward voice messages to other Cisco Unity servers. Provides message distribution and directory access to all Cisco Unity users. Includes Audio Messaging Interchange Specification (AMIS) communication protocol for connection to legacy analog voice-mail systems.
Cisco Unity Bridge	Connects Cisco Unity servers with analog OctelNet servers	Provides voice messaging between legacy Octel systems and Cisco Unity Voice Messaging. Integrates the Cisco Unity Voice Messaging with Octel databases.
Unity System Administrator	Web-based system administration interface	Provides a web-based console and tools for installation, maintenance, and user database administration.

System Capabilities

Cisco Unity Voice Messaging includes the following system capabilities:

- Integrates into Microsoft BackOffice, where Microsoft Exchange 2000 holds all database information and all messages are stored in the Exchange private message store
- Supports these open standards: Lightweight Directory Access Protocol (LDAP), Mail Application Programing Interface (MAPI), Telephony Application Programing Interface (TAPI), and Windows 2000 Active Directories
- Uses native 32-bit NT services to provide optimum scalability, reliability, and performance

- Offers class of service (CoS) designations to the system administrator for setting up groups of users with common characteristics instead of programming all of the settings for each individual user
- Supports Simple Mail Transfer Protocol/Multipurpose Internet Mail Extension (SMTP/MIME), Post Office Protocol (POP3), and Internet Message Access Protocol (IMAP4) e-mail clients through Microsoft Exchange e-mail gateway services
- Uses streaming media for efficient audio delivery
- Provides fault-tolerant system tools for security, file replication, event logging, and Simple Network Management Protocol (SNMP) support
- Supports AMIS communications protocol features that provide communication with AMIS-compliant voice-mail servers such as Octel 250, Octel 350, Siemens PhoneMail System, and Repartee systems

Key Features

Table 5-4 describes the features provided by Cisco Unity Voice Messaging.

Table 5-4 Features of Cisco Unity Voice Messaging

Feature	Description
Easy message access	Subscribers can press one button on their phone to retrieve new messages from their voice mailboxes without entering a personal ID number. To prevent unauthorized access to messages, subscribers can require that a security code to be entered before message playback.
Caller identification	When available with the telephone system, automatic number identification (ANI) or caller ID (CID) integration gives the telephone number of the outside caller with the voice message.
Message waiting indication (MWI)	Cisco Unity lights a message-waiting lamp, activates a display, or provides a stutter dial tone on the subscriber's extension when new messages are received.

Table 5-4 Features of Cisco Unity Voice Messaging (continued)

Feature	Description
Call forward to a personal greeting	Callers can leave messages for subscribers who are busy or away from their desks. With this feature, incoming calls that are routed to an unanswered or busy extension are automatically forwarded to a subscriber's voice mailbox.
Multilingual support	Cisco Unity Voice Messaging supports voice prompts in multiple languages, including Spanish (Colombian and European), Dutch, Norwegian, Swedish, Italian, Chinese Mandarin, French, German, Japanese, and English for North America, United Kingdom, Australia, and New Zealand.

Configuration Options for Cisco Unity Voice Messaging

Cisco Unity Voice Messaging on the Cisco ICS 7750 can be configured in a standalone or networked environment. The following configurations are available.

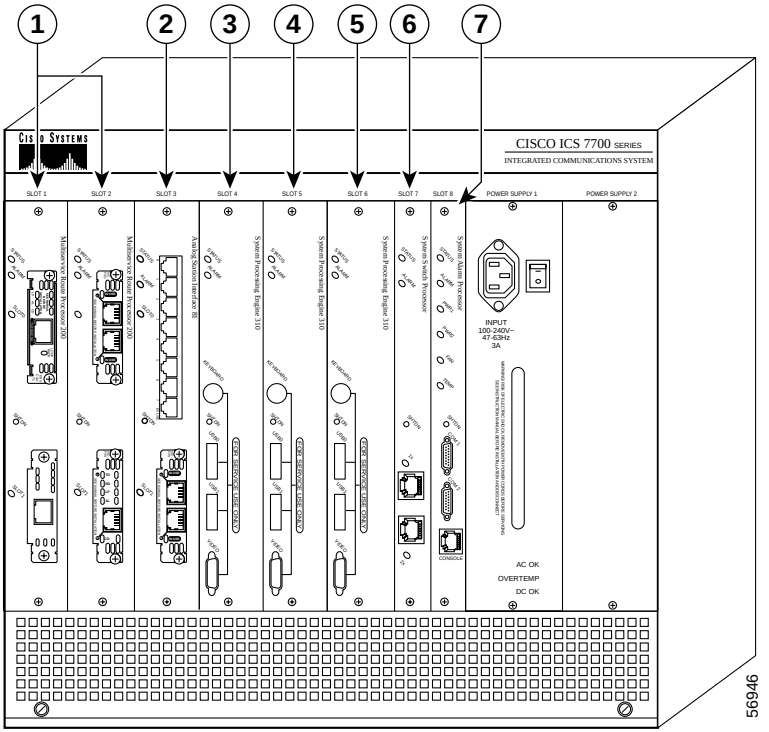
Note Cisco Unity Unified Messaging is not supported at this time. This means that the Exchange 2000 message store on the SPE310 cannot be used for sending and receiving e-mail. Configuring Digital Networking will enable the exchange of voice messages between the plain old voice (POV) Cisco Unity SPE on the Cisco ICS 7750 and other non–ICS 7750 Unity servers that have unified messaging.

- Standalone Cisco Unity Voice Messaging—All the components for Cisco Unity Voice Messaging are installed on SPEs within the Cisco ICS 7750 system.
- Networked to other Cisco Unity Servers—Digital Networking is a licensed feature that provides connectivity between Cisco Unity Voice Messaging and other Cisco Unity servers. By using the existing LAN/WAN infrastructure, messages are routed between Active Directory sites and MS Exchange 2000 Routing Groups.

- Networked to AMIS-compliant voice-mail systems—By using the Digital Networking licensed feature, the Cisco Unity Voice Messaging system can connect to other AMIS-compliant voice-mail systems. These connections are made through the Public Switched Telephone Network (PSTN) by using multiservice route processors (MRPs) in the Cisco ICS 7750 that support the following:
  - T-1 ports
  - Foreign Exchange Office (FXO) ports
- Networked to legacy OctelNet servers—The Cisco Unity Bridge is a licensed feature that provides connectivity between Cisco Unity and analog OctelNet servers. This feature integrates the Cisco Unity Voice Messaging and legacy Octel databases. The Cisco Unity Bridge requires a separate Dell 1400 server with Brooktrout TR114 voice cards placed within the server. Up to 24 ports are supported, available in increments of 4 ports.

Figure 5-2 shows the locations of the hardware and software components in the standalone system configuration.

Figure 5-2 Locations of Components in the Cisco ICS 7750



1	Multiservice route processors (MRPs) in slots 1 and 2	**5**	SPE running System Manager and Cisco CallManager (slot 6)
2	(Optional slot 3 for MRP, analog station interface (ASI) or SPE)	**6**	System switch processor (SSP)
3	SPE running Cisco Unity Voice Messaging* (slot 4)	**7**	System alarm processor (SAP)
4	SPE running Cisco CallManager (optional slot 5)		

*The SPE running Cisco Unity Voice Messaging (callout 3) has the following software components:

- Domain controller with Active Directory
- DNS server (can use an existing network DNS server)

- MS Exchange 2000
- Microsoft Data Engine (MSDE)
- Microsoft SQL Enterprise Manager

Specifications

Table 5-5 provides specifications for Cisco Unity Release 3.1(3) on the Cisco ICS 7750.

Table 5-5 Specifications for Cisco Unity on the Cisco ICS 7750

Type	Description
Platform	The SPE310 for applications with Windows 2000 Server and ICS System Manager Core Software.
Network environment	The domain controller and Active Directory are installed on the SPE310. Cisco Unity Voice Mail components must all be members of the same domain. A DNS server is configured on the SPE310 (or on an existing DNS server) for translating network names to IP addresses when sending messages across the network.
Telephony integration	Cisco CallManager, Release 3.1(2c) or later. Cisco Unity–Cisco CallManager (Cisco Unity–CM) TAPI Service Provider (TSP) for integrating Cisco Unity with Cisco CallManager. The TSP provides the TAPI session and call control service.
Message store	Microsoft Exchange 2000 (does not support Exchange 5.5) for storing and managing messages.
Global directory database	MSDE (does not support Microsoft SQL) for storing and querying subscriber profile information.
Browser	Microsoft Internet Explorer 5.5 for accessing web-based administration tools.
Remote access software	Symantec pcAnywhere (optional) for accessing the Cisco Unity server remotely.
Backup utility	VERITAS Backup Exec (optional) for backing up the Cisco Unity Voice Messaging system.
Capacity	A maximum of 24 ports and a maximum of 500 users are supported.

Qualified Combinations of Product Releases

Cisco Unity Voice Messaging and the Cisco Unity–CM TSP have been qualified for the product combinations identified in Table 5-6.

Table 5-6 Qualified Combinations of Product Releases

Cisco Unity Voice Messaging Release	Cisco Unity–CM TSP Release	Cisco CallManager Release	ICS System Manager Core Software Release
3.0(1)	3.0(2)	3.1(2c)	2.1.0, 2.2.0
3.1(2)	3.1(2), 6.0(1)	3.1(2c), 3.2(1)	2.1.0, 2.2.0
3.1(3)	6.0(1)	3.1(2c), 3.2(1)	2.1.0, 2.2.0

Cisco Customer Response Applications

The Cisco CRA product family provides a variety of contact processing functionalities for a Cisco IP Telephony Solution. Each product in the CRA family includes features for automating interactions with customers.

The CRA products use the Cisco Customer Response Applications (CRA) Engine to run applications and to respond to customer inquiries. The software product that you choose determines the components, step libraries, and subsystems that you receive.

These are the products and components in the CRA product family:

- Cisco IP Interactive Voice Response (IP IVR)—Provides automated call handling and includes Cisco IP Auto Attendant (Cisco IP AA) for answering and directing calls
- Cisco IP Integrated Contact Distribution (IP ICD)—Answers, queues, and distributes calls to IP ICD agents.

Key Features

The Cisco Customer Response (CR) Platform builds on the Cisco IP Telephony Solution foundation to provide interactive telephony and multimedia services for customers.

The CR Platform provides the features and benefits described in Table 5-7.

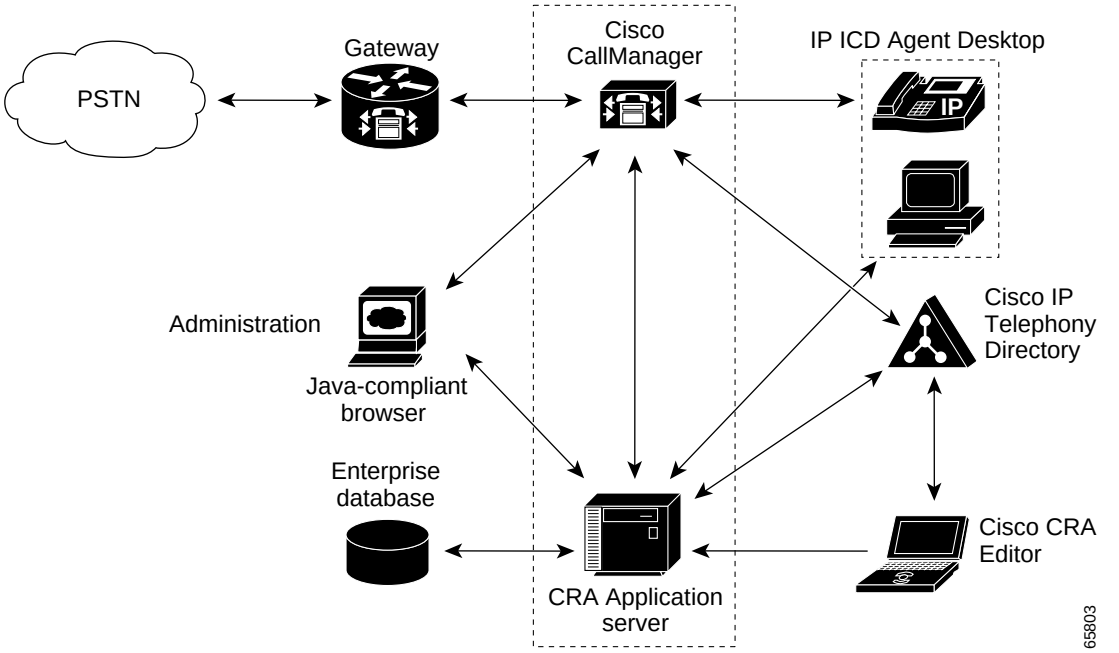
Table 5-7 Key Features of the Cisco CR Platform

Feature	Description
Open architecture design	Allows integration with a variety of technologies and products to provide agent-assisted service (IP ICD) and self-service (IP IVR) to customers. Stores application scripts in an industry-standard LDAP directory. Supports Open DataBase Connectivity (ODBC) access to Microsoft Structured Query Language (SQL) servers, Oracle, Sybase, and IBM DB2 databases.
Web-based administration	Can be maintained and administered by using a web browser. Can be accessed from any computer on the IP network.

Components

The Cisco CR Platform integrates a number of components to provide the features and functionality for IP IVR and IP ICD. Figure 5-3 shows how CRA integrates with a Cisco IP Telephony Solution. The diagram shows Cisco CallManager and CRA applications running on separate dedicated servers, which are SPEs in the Cisco ICS 7750. Cisco CallManager and CRA applications can also be installed on the same SPE.

Figure 5-3 Cisco IP Telephony Solution Components



As Figure 5-3 shows, a Cisco IP Telephony Solution system has these main components:

- Gateway—Connects the enterprise IP telephony network to the PSTN and to other private telephone systems, such as a PBX. In the Cisco ICS 7750, the MRP provides the gateway function.
- Cisco CallManager server—Provides the features for the IP phones, manages gateways, provides failover and redundancy service for the telephony system, and directs VoIP traffic to the CRA system. In the Cisco ICS 7750, the Cisco CallManager server runs on an SPE.
- Cisco IP Telephony Directory—Stores configuration information and CRA application scripts in an LDAP directory. The subdirectory that stores CRA scripts is called the *Repository*. Storing application scripts and configuration information in an LDAP directory allows loading application scripts on any CRA server in the network. The Repository keeps one backup version of each script for recovery purposes.

- CRA server—Contains the CRA Engine that runs CRA application scripts. CRA application scripts use a series of steps that are implemented as Java Beans packaged in *.jar files. In the Cisco ICS 7750, the CRA server runs on an SPE.
- CRA Editor—Allows designers to create, modify, and debug CRA application scripts containing workflow steps.

The Cisco CRA components are described in Table 5-8.

Table 5-8 Components of Cisco Customer Response Applications

Component	Key Function	Description
CRA Engine	Runs voice application scripts for responding to customer interactions	Application scripts contain steps that are blocks of logic. Steps are connected in flows in an application script to create IVR and ICD solutions. Runs multiple application scripts simultaneously. Updates application scripts in real time and pushes them to the CRA Engine without restarting the CRA Engine. Supports a debug mode for testing new application scripts before uploading them to production. Includes these subsystems and features: • Application—Provides service for generic applications that do not use telephony services. • Database—Handles connections between the application server and enterprise databases. • E-mail—Adds components that allow the applications engine to send e-mail. • HTTP—Adds components that allow the applications engine to respond to HTTP requests. • JTAPI—Manages the connection between Cisco CallManager CTI Manager and the Cisco CRA Engine.

Table 5-8 Components of Cisco Customer Response Applications (continued)

Component	Key Function	Description
Cisco CRA Editor	For building and debugging application scripts that automate customer interactions	A Windows GUI-based tool for application designers to use for customizing both Cisco IP IVR and Cisco IP ICD application scripts. Has a graphical interface with a palette of steps that are blocks of contact-processing logic written in Java. Designers can drag and drop steps and connect them into new application scripts without knowing Java programming. Has a built-in debugging tool for testing new application scripts. Includes sample application scripts for both IP ICD and IP IVR. Can be downloaded from the Cisco CRA Application Administrator web page and installed on any PC in the WAN. Runs in Windows 95, 98, NT 4.0, and Windows 2000 environments.
Repository	For storing voice application scripts	A centralized industry-standard LDAP directory for storing the application scripts that are built with the CRA Editor. Implemented as a subdirectory in DC Directory (part of Cisco CallManager) or in a remote LDAP directory service, such as Netscape Directory Server, or in Microsoft Active Directory, for the Repository. Uses the Repository Manager program to store application scripts in the Repository. Stores all CRA Engine configuration profiles for IP IVR and IP ICD solutions.

Table 5-8 Components of Cisco Customer Response Applications (continued)

Component	Key Function	Description
CRA Real-Time Reporting	Generates reports of system statistics	A web-based reporting tool for monitoring the system. Generates on-demand and scheduled reports about system activity. Provides reports of statistics for IP ICD agent and group activity.
CRA Software Developer's Kit (SDK)	For creating or modify CRA Editor steps for customized applications	A tool for adding or customizing functionality by creating new subsystems and steps. Requires knowledge and experience with Java programming. Must be installed with Cisco CallManager 3.1. An optional tool that must be purchased as an additional CRA application.
CRA Application Administrator	For setting up and modifying system configuration	A web-based application for administering the CRA applications. Can be accessed from anywhere on the IP network. Configures Resource Manager for IP ICD groups, agents, and queues.

Cisco IP Interactive Voice Response Product

Cisco IP IVR automates call handling by autonomously interacting with users. In addition to handling traditional telephony contacts, IP IVR applications can respond to HTTP requests and send e-mail.

Features

IP IVR automates call handling by using the following features:

- Processes user commands that are selected from a menu, and provides responses such as transferring to a sales department or listening to a recording
- Performs *prompt and collect* functions to obtain user data such as passwords or account identification

- Supports ODBC access to databases for retrieving or entering data such as access to checking account information
- Extracts and parses web-based content, and presents the data to customers who are using a telephone, thereby delivering web-maintained information to a voice media user
- Supports up to 48 ports in a dedicated SPE310 configuration and up to 10 ports in an SPE310 configuration that is co-resident with Cisco CallManger

Cisco IP Integrated Contact Distribution Product

Cisco IP ICD is an IP-based automatic call distribution (ACD) system. IP ICD queues and distributes incoming calls that are destined for groups of IP ICD agents. There can be a total of 48 agents in as many as 48 groups.

By integrating IP ICD with IP IVR, it is possible to gather caller data and to classify incoming calls. Calls can be directed to specific groups, based on this information.

IP ICD includes the web-based CRA Real-Time Reporting system for monitoring the IP ICD agents, the Event Service Desk, and resource performance.

Features

IP ICD automatically answers and distributes calls by using the following features:

- Agents use the IP ICD Agent Desktop to log in, to become available or unavailable for calls, and to monitor their current status.
- Calls are distributed by using one of these methods:
  - Hunt group using weighted linear routing.
  - Distribution group using circular routing.
  - Longest available agent.
- An incoming call is immediately answered when an IP ICD agent is available.
- When an IP ICD agent is not available, the call goes into a queue.

- A call in queue hears messages with progress announcements or advertisements.
- Queue scripts are built by using the CRA Editor. These application scripts determine the queuing messages and handle the in-queue call. Sample scripts are available, and customized scripts can be built.

Components

The IP ICD system has three major components:

- Resource Manager—Monitors the IP ICD agent phones and organizes agents into resource groups. Resource groups constitute a collection of IP ICD agents that are capable of handling the same types of calls. The Resource Manager is configured by using the CRA Administration web interface.
- Event Service Desk—Places incoming calls in queue and distributes them to the appropriate Resource Group as agents become available. The Event Service Desk is configured by using the CRA Administration web interface.
- IP ICD Agent Desktop—An application program that IP ICD agents run on their desktop computers to log in to the system, to change the IP ICD state, and to monitor status.

Specifications

When installed in the Cisco ICS 7750 system, IP ICD and IP IVR have the specifications given in Table 5-9.

Table 5-9 Specifications for IP ICD and IP IVR

Type	Description
Hardware platform	SPE310 with ICS 7750 Release 2.1.0 or later. • IP ICD or IP IVR can be co-resident on an SPE with Cisco CallManager. • IP ICD and/or IP IVR can be on a dedicated SPE.
Software platform	CRA Platform, Release 2.2.
Telephony integration	Cisco CallManager 3.1 and later.
Directory	DC Directory (comes with Cisco CallManager) or any LDAP directory service such as Netscape Directory Server or Microsoft Active Directory.

Table 5-9 Specifications for IP ICD and IP IVR (continued)

Type	Description
Database	Microsoft SQL server, Oracle, Sybase, or IBM DB2 databases.
Browser	Microsoft Internet Explorer 5.5.
Capacity	• When installed on the same SPE that Cisco CallManager is installed on—up to 10 ports or simultaneous sessions. • When installed on a dedicated SPE—up to 48 ports or simultaneous sessions.

External Software Applications

The following software can be run on other devices and can interoperate with the Cisco ICS 7750:

- Cisco IOS Firewall, page 5-22
- CiscoWorks2000, page 5-25

Cisco IOS Firewall

The Cisco IOS Firewall is a security-specific option for Cisco IOS software. Cisco IOS Firewall integrates firewall functionality and intrusion detection for every network perimeter and enhances existing Cisco IOS security capabilities. When combined with Cisco IOS IP Security (IPSec) software and other Cisco IOS software-based technologies such as Layer 2 Tunneling Protocol (L2TP) and quality of service (QoS), the Cisco IOS Firewall provides a complete, integrated Virtual Private Network (VPN) solution.

The Cisco IOS Firewall enables the integration of multiprotocol routing with security policy enforcement by configuring a Cisco router as a firewall. The Cisco IOS Firewall interoperates seamlessly with Cisco IOS software to provide the following benefits:

- Flexibility—When installed on a Cisco router, Cisco IOS Firewall performs multiprotocol routing, perimeter security, intrusion detection, VPN functionality, and per-user authentication and authorization.
- Investment protection—Cisco IOS Firewall can be integrated into a multiprotocol router to leverage existing router investment.

- VPN support—Combining Cisco IOS Firewall with Cisco IOS encryption and QoS VPN features enables secure, low-cost transmissions over public networks.
- Scalability—Cisco IOS Firewall scales to meet any network's bandwidth and performance requirements.
- Easier management—Using Cisco ConfigMaker software, network administrators can configure Cisco IOS security features (including the Cisco IOS Firewall, network address translation, and Cisco IPSec) from a central console over the network.

Key Features

Table 5-10 lists key features supported by the Cisco IOS Firewall.

Table 5-10 Key Features of Cisco IOS Firewall

Feature	Description
Context-based access control (CBAC)	Provides internal users secure, per-application-based access control for all traffic across perimeters, such as perimeters between private enterprise networks and the Internet.
Intrusion detection	Provides real-time monitoring, interception, and response to network misuse with a broad set of the most common attack and information-gathering intrusion detection signatures.
Authentication proxy	Dynamic, per-user authentication and authorization for LAN-based and dial-in communications; authenticates users against industry-standard TACACS+ and RADIUS authentication protocols; network administrators can set individual, per-user security policies.
Denial-of-service detection and prevention	Defends and protects router resources against common attacks; checks packet headers, dropping suspicious packets.
Dynamic port mapping	Allows network administrator to run CBAC-supported applications on non-standard ports.
Java applet blocking	Protects against unidentified, malicious Java applets.

Table 5-10 Key Features of Cisco IOS Firewall (continued)

Feature	Description
VPNs, IPSec encryption, and QoS support	Operates with Cisco IOS software encryption, tunneling, and QoS features to secure VPNs. Provides scalable, encrypted tunnels on the router while integrating strong perimeter security, advanced bandwidth management, intrusion detection, and service-level validation. Standards based for interoperability: Supports Internet Protocol Security (IPSec) encryption standards with both 56-bit Data Encryption Standards (DES) and 168-bit Triple DES (3DES); generic routing encapsulation (GRE); Layer 2 forwarding (L2F); Layer 2 tunneling protocol (L2TP).
Real-time alerts	Logs alerts for denial-of-service attacks or other preconfigured conditions; configurable on a per-application, per-feature basis.
Audit trail	Details transactions; records time stamp, source host, destination host, ports, duration, and total number of bytes transmitted for detailed reporting; configurable on a per-application, per-feature basis.
Event logging	Allows administrators to track potential security breaches or other nonstandard activities in real time by logging system error message output to a console terminal or syslog server, setting severity levels, and recording other parameters.
Firewall management	Wizard-based network configuration tool offers step-by-step guidance through network design, addressing, and Cisco IOS Firewall security policy configurations.
Integration with Cisco IOS software	Interoperates with Cisco IOS features, integrating security policy enforcement into the network.
Basic and advanced traffic filtering	Standard and extended access control lists (ACLs) let you apply access controls to specific network segments and define the traffic permitted to pass through a network segment.
Policy-based multi-interface support	Can control user access by IP address and interface as determined by the security policy.
Redundancy/failover	Automatically routes traffic to a backup router if a failure occurs.
Network address translation	Hides internal network from the outside for enhanced security.

Table 5-10 Key Features of Cisco IOS Firewall (continued)

Feature	Description
Time-based access lists	Defines security policy by time of day and day of week.
Peer router authentication	Ensures that routers receive reliable routing information from trusted sources.
Improved attack detection and defense for e-mail servers	New intrusion detection is designed specifically for SMTP-oriented attacks.

CiscoWorks2000

The CiscoWorks2000 solutions assist in managing the enterprise network. These solutions address three areas in the network: WAN, LAN, and service level management.

- LAN Management Solution (LMS)
- Routed WAN Management Solution
- Service Management Solution (SMS)

Several advanced applications are also available:

- CiscoWorks2000 Device Fault Manager (DFM)—provides real-time, detailed fault analysis for Cisco devices.
- User Registration Tool (URT)—actively identifies users with the network and creates user policy bindings for policy registration, mobility, and tracking.
- CiscoWorks2000 Voice Manager (CVM)—web-based voice management and reporting tool provides enhanced capabilities to configure and provision voice ports, and create and modify dial plans on voice-enabled Cisco routers for VoIP, Voice over Frame Relay (VoFR), and Voice over Asynchronous Transfer Mode (VoATM) networks.

LAN Management Solution

LMS features web versions of the Layer 2/Layer 3 topology tool, user tracking, virtual LAN (VLAN) manager, path trace, and other functions from CiscoWorks for Switched Internetworks (CWSI). Table 5-11 summarizes the applications included in LMS.

Table 5-11 Applications Included in CiscoWorks2000 LAN Management Solution

Application	Key Function	Key Benefits
Campus Manager	Layer 2/Layer 3 switch topology representation with a device locator	Displays the physical and logical relationship between Cisco devices, including link type, device type, and discrepancies
	VLAN and ATM configuration tools	Provides a table-type interface for creating and managing VLANs and ATM networks
	Connectivity analysis between two devices in the network	Traces data paths between specific end station devices or IP phone handsets in the network to determine packet responsiveness and the list of devices making up the connection
	Extensive user tracking tool	Finds users based on Media Access Control (MAC) connectivity; provides detailed information about users, work stations, or handsets, such as IP address, subnet, and VLAN
Content Flow Monitor	Performance monitoring for Cisco load-balancing server devices	Monitors the resource utilization of the Cisco LocalDirector and Cisco 7200 series server devices
TrafficDirector	RMON/RMON2 statistics collection from Cisco devices and probes	Monitors and troubleshoots LAN traffic at the physical, protocol, and application layers
	Setup of traffic-related thresholds and monitoring of historical traffic patterns	Implements a proactive monitoring system to inform administrators of unusual traffic characteristics

Table 5-11 Applications Included in CiscoWorks2000 LAN Management Solution (continued)

Application	Key Function	Key Benefits
Resource Manager Essentials	Consolidated troubleshooting tools device center	Switch and router analysis tools accessible from a single location; linkage of third-party applications to device center
	Detailed software and hardware inventory reporting	Provides accurate Cisco inventory baseline information, including memory, slots, software versions, and boot ROMs, to make decisions about the network
	Automated update engine for device software and configuration	Can send router and switch device software updates to selected devices on a schedule; reduces time and errors involved in network updates
	Centralized change audit logging and application access security	Comprehensive change monitoring log records users and applications active on the network; desktop controls user access to applications, ensuring only appropriate class of user can access tools that change network parameters
CiscoView	Web-based graphics device management	Displays a console representation of Cisco router and switch devices (color-coded to indicate operational status) with access to configuration and monitoring tools

Routed WAN Management Solution

Routed WAN Management Solution provides wide-area network monitoring, troubleshooting, traffic management, access control, and applications to administer the routed infrastructure of multiservice and VPN routing platforms built with Cisco products. Table 5-12 summarizes the applications included in the Routed WAN Management Solution.

Table 5-12 Applications Included in CiscoWorks2000 Routed WAN Management Solution

Application	Key Function	Key Benefits
Access Control List (ACL) Manager	ACL optimization	Improves router performance by organizing ACL filters to sort by most frequent usage patterns
	ACL profiles	Allows administrators to quickly and uniformly apply and update policy-based ACLs, reducing WAN costs and enhancing security management
	ACL distribution	Allows administrators to automate the updating of ACL information in multiple devices
Internetwork Performance Monitor (IPM)	Monitoring of WAN response time characteristics	Determines the responsiveness of WAN connections to find bottlenecks; provides real-time analysis of end-to-end hop delays
TrafficDirector	Remote Monitoring (RMON/RMON2) statistics collection from Cisco devices and probes	Monitors and troubleshoots LAN traffic at the physical, protocol, and application layers
	Setup of traffic-related thresholds and monitoring of historical traffic patterns	Implements a proactive monitoring system to inform administrators of unusual traffic characteristics

Table 5-12 Applications Included in CiscoWorks2000 Routed WAN Management Solution (continued)

Application	Key Function	Key Benefits
Resource Manager Essentials	Consolidated troubleshooting tools device center	Switch and router analysis tools accessible from a single location; linkage of third-party applications to device center
	Detailed software and hardware inventory reporting	Provides accurate Cisco inventory baseline information, including memory, slots, software versions, and boot ROMs, to make decisions about the network
	Automated update engine for device software and configuration	Can send router and switch device software updates to selected devices on a schedule; reduces time and errors involved in network updates
	Centralized change audit logging and application access security	Comprehensive change monitoring log records users and applications active on the network; desktop controls user access to applications, ensuring only appropriate class of user can access tools that change network parameters
CiscoView	Web-based graphics device management	Displays a console representation of Cisco router and switch devices (color-coded to indicate operational status) with access to configuration and monitoring tools

Service Management Solution

SMS provides capabilities for managing network service levels and monitoring QoS embedded within Cisco infrastructures. Table 5-13 summarizes the applications included in SMS.

Table 5-13 Applications Included in CiscoWorks2000 Service Management Solution

Application	Key Function	Key Benefits
Service Level Manager	Authoring tool for defining service-level contracts	Allows administrators to quickly and uniformly define service-level contracts (SLCs) and service-level agreements (SLAs)
	Service-level monitoring and reporting	Allows both business and operational personnel to quickly view service-level conformance
ME1100 Hardware Collector	Data collection	Provides an interface and data collection between the service-level manager software and the device on which the system administrator agent is configured
CiscoView	Web-based graphics device management	Displays a console representation of Cisco router and switch devices (color-coded to indicate operational status) with access to configuration and monitoring tools
Cisco Management Connection	End-to-end service-level management	Allows service-level data to be shared with third-party and customer applications, enabling end-to-end management

CHAPTER 6

Features of Cisco IP Phones

Cisco IP Phones are full-featured devices that provide voice communication over an IP network. These Cisco IP Phones function like traditional analog telephones, so that you can place and receive calls and perform functions, such as call forwarding, redialing, speed dialing, transferring calls, placing conference calls, and accessing voice mail.

These Cisco IP Phone models are available:

- Cisco IP Phone 7960 and Cisco IP Phone 7940, page 6-2
- Cisco IP Phone 7910 and 7910+SW, page 6-5
- Cisco IP Phone 7910 and 7910+SW, page 6-5
- Cisco IP Phone Expansion Module 7914, page 6-9
- Cisco IP Conference Station 7935, page 6-12

Note All Cisco IP Phones support G.711 and G.729a audio compression.

Additionally, two Cisco software applications can increase the functionality of the Cisco IP Phone:

- Cisco IP SoftPhone, page 6-16
- Cisco CallManager Attendant Console, page 6-20

Cisco IP Phone 7960 and Cisco IP Phone 7940

The Cisco IP Phone 7960 is a full-featured, multiline phone used primarily by managers and executives. The Cisco 7960 has six programmable buttons for lines or for speed dialing, and it has four interactive soft keys.

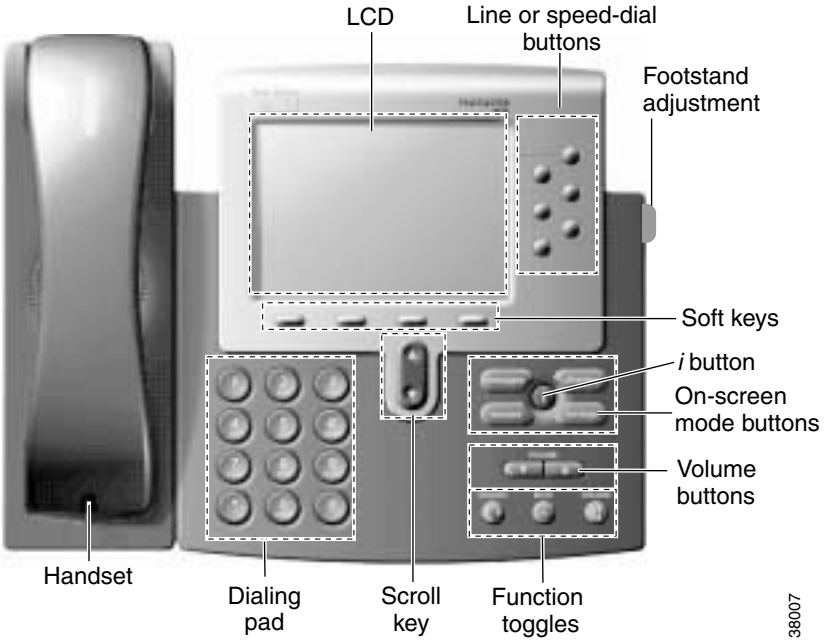
The Cisco IP Phone 7940 is for low-to-medium-traffic users who need a minimum of directory numbers. The Cisco 7940 model has two programmable buttons for lines or speed dialing.This is the only difference between the Cisco 7960 and the Cisco 7940.

The large LCD screen shows the time and date, the phone number, the calling party name and number, and the line/call status. The display can show graphics and web-based information such as directories and stock reports.

The phone operates with IP telephony systems based on Cisco CallManager technology, H.323, or Session Initiated Protocol (SIP).

Figure 6-1 shows the Cisco IP Phone 7960. The Cisco IP Phone 7940 has only two line or speed dial buttons.

Figure 6-1 Cisco IP Phone 7960



Key Features

The Cisco IP Phone 7960 and Cisco IP Phone 7940 include the following key features:

- Cisco IP Phone 7960—Six programmable line/feature buttons and four interactive soft keys.
- Cisco IP Phone 7940—Two programmable line/feature buttons and four interactive soft keys.
- Two RJ-45 ports that support 10/100-Mbps half- or full-duplex connections to external devices:
  - One connector connects the phone to the Catalyst switch, using a straight-through cable; the phone can receive inline power from the Catalyst switch over this connection.
  - The other connector connects the phone to a network device, such as a computer, using a straight-through cable.
- A minimum of 24 user-adjustable ring tones.
- G.711 and G.729a audio compression.
- H.323 and Microsoft NetMeeting compatibility.
- A hearing-aid–compatible handset, which meets the American Disabilities Act (ADA) requirements.
- Messages—Identifies incoming calls and categorizes them on the screen. The user can return calls quickly and effectively by using the direct dial-back capability.
- Directories—The corporate directory integrates with the Lightweight Directory Access Protocol (LDAP3) standard directory.
- Settings—The Settings feature key permits adjusting display contrast and selecting ringer tone and volume settings for all audio, such as ringer, handset, headset, and speaker.
- Configuration—Can be configured automatically or set up manually for Dynamic Host Control Protocol (DHCP), Trivial File Transfer Protocol (TFTP), Cisco CallManager, and backup Cisco CallManagers.

- Services—For accessing any web-based information using Extensible Markup Language (XML).
- Help—Online help provides information about all of the capabilities of the phone.
- Comfort noise generation and voice activity detection (VAD) programming system-wide.
- EIA/TIA-232 port—For options such as line expansion and security access.

Technical Specifications

Table 6-1 lists the technical specifications for the Cisco IP Phone 7960 and the Cisco IP Phone 7940.

Table 6-1 Technical Specifications for the Cisco IP Phone 7960 and the Cisco IP Phone 7940

Type	Description
Dimensions	Height: 8 in. (20.32 cm) Width: 10.5 in. (26.67 cm) Depth: 6 in. (415.24 cm)
Weight	3.5 lb (1.6 kg)
Temperature	Operating: 32 to 104ºF (0 to 40ºC) Nonoperating: 14 to 140ºF (–10 to 60ºC)
Relative humidity	Operating: 10 to 95% (noncondensing)
Power	100 to 240 VAC, 50 to 60 Hz, 0.5A (when using the AC adapter) 48 VDC, 0.2A (when using the in-line power over the network cable)
Cables	Two pairs of Category 3 for 10-Mbps cables Two pairs of Category 5 for 100-Mbps cables
Distance	Most Cisco IP phones should be within 330 ft (100 m) of a phone closet

Table 6-1 Technical Specifications for the Cisco IP Phone 7960 and the Cisco IP Phone 7940 (continued)

Type	Description
Safety	UL 1950 CSA C22.2 No. 950 AS/NZS 3260 IEC 60950 EN 60950 TS001 CE Marking
Emissions	FCC (47CFR) Part 15 Class B EN 55022b Class B VCCI Class B AS/NZS 3548 Class B
Telecom	IC CS-03 FCC (47CFR) Part 68
Standards	IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 100BASE-X ports IEEE 802.1D Spanning-Tree Protocol IEEE 802.1p CoS prioritization IEEE 802.1Q VLAN IEEE 802.3z 1000BASE-X specification 1000BASE-X (GBIC) 1000BASE-SX 1000BASE-LX/LH 1000BASE-ZX IEEE 802.3u 100BASE-TX specification IEEE 802.3 10BASE-T specification
Mounting options	19-in. rack

Cisco IP Phone 7910 and 7910+SW

The Cisco IP Phone 7910 and the Cisco IP Phone 7910+SW are basic telephones intended primarily for areas that require only basic features, such as lobbies, break rooms, and hallways. The Cisco IP Phone 7910+SW includes a Cisco two-port switch for connecting the phone to a PC or other Ethernet device.

The LCD display shows the time and date, the phone number, the calling party name and number, and the line or call status. The phone operates with IP telephony systems based on Cisco CallManager technology.

Figure 6-2 shows the Cisco IP Phone 7910.

Figure 6-2 Cisco IP Phone 7910

1	Handset with indicator light	**9**	Programmable button
2	LCD screen	**10**	Programmable button
3	Line button	**11**	Programmable button
4	Hold button	**12**	Speaker
5	Transfer button	**13**	Mute
6	Settings button	**14**	Volume buttons
7	Footstand adjustment	**15**	Speed Dialing buttons
8	Programmable buttons	**16**	Dialing pad

Key Features

The Cisco IP Phone 7910 and the Cisco IP Phone 7910+SW include the following key features:

- One line with four dedicated feature buttons (line, hold, transfer, and settings).
- The Cisco 7910 has one standard 10BASE-T RJ-45 connection.
- The Cisco 7910+SW has two standard 10/100BASE-T RJ-45 interfaces.
- G.711 and G.729a audio compression.
- H.323 and Microsoft NetMeeting compatibility.
- A hearing-aid–compatible handset, which meets the ADA requirements.
- Settings—The Settings feature key permits adjusting of the display contrast and selecting of the ringer tone and volume settings for all the audio, such as ringer, handset, headset, and speaker.
- Configuration—Can be either configured automatically or set up manually for DHCP, TFTP, Cisco CallManager, and backup Cisco CallManagers.
- Comfort noise generation and VAD programming system-wide.

Technical Specifications

Table 6-2 lists the technical specifications for the Cisco IP Phone 7910 and the Cisco IP Phone 7910+SW.

Table 6-2 Technical Specifications for the Cisco IP Phone 7910 and Cisco IP Phone 7910+SW

Type	Description
Dimensions	Height: 8 in. (20.32 cm) Width: 10.5 in. (26.67 cm) Depth: 6 in. (415.24 cm)
Weight	2.2 lb (1.0 kg
Temperature	Operating: 32 to 104° F (0 to 40 C°) Nonoperating: 14 to 140° F –10 to 60° C)

Table 6-2 Technical Specifications for the Cisco IP Phone 7910 and Cisco IP Phone 7910+SW (continued)

Type	Description
Relative humidity	Operating: 10 to 95% (noncondensing)
Power	100 to 240 VAC, 50 to 60 Hz, 0.5A (when using the AC adapter) 48 VDC, 0.2A (when using the in-line power over the network cable)
Cables	Two pair of Category 3 for 10-Mbps cables Two pair of Category 5 for 100-Mbps cables
Distance	Most Cisco IP phones should be within 330 ft (100 m) of a phone closet
Safety	UL 1950 CSA C22.2 No. 950 AS/NZS 3260 IEC 60950 EN 60950 TS001 CE Marking
Emissions	FCC (47CFR) Part 15 Class B EN 55022b Class B VCCI Class B AS/NZS 3548 Class B
Telecom	IC CS-03 FCC (47CFR)Part 68
Standards	IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 100BASE-X ports IEEE 802.1D Spanning-Tree Protocol IEEE 802.1p CoS prioritization IEEE 802.1Q VLAN IEEE 802.3z 1000BASE-X specification 1000BASE-X (GBIC) 1000BASE-SX 1000BASE-LX/LH 1000BASE-ZX IEEE 802.3u 100BASE-TX specification IEEE 802.3 10BASE-T specification
Mounting options	19-in. rack

Cisco IP Phone Expansion Module 7914

The Cisco IP Phone Expansion Module 7914 attaches to the Cisco IP Phone 7960 and adds 14 buttons and an LCD display to aid administrative assistants and others who must monitor and manage calls. These buttons can be programmed as directory numbers (DNs), line keys, or speed-dial keys.

Two expansion modules can be attached to the IP phone, for a total of 34 line and/or speed dial buttons as shown in Figure 6-3.

Figure 6-3 Cisco IP Phone 7960 with Two Expansion Modules

1	LCD screen—Displays information about each button.
2	Lighted buttons—Buttons that are each assigned as a line with a directory number or as a speed-dial button.

Key Features

The LCD screen shows the information about a programmable button. It displays the directory number or the text label, such as a name, that is assigned to the button. A speed dialing button displays the phone number or text name.

Line buttons that are assigned with directory numbers can be illuminated to show the line status information identified in Table 6-4.

Table 6-3 Lighted Buttons and Line Status

Button Light	Line Status
Off/dark	Line is available.
Green, steady	Line is in use by user; user can transfer the call.
Red, steady	Line is in use by someone else.
Amber, flashing	Line is ringing.
Green, flashing	The user put the call on hold.
Red, flashing	Someone else has the call on hold.

Each button that is not used as a directory number or line key can be programmed as a speed-dial key by using the Cisco IP Phone User Options web page.

To attach the expansion module to a Cisco IP Phone 7960, use the single footstand for one module. Use a double footstand to attach two modules.

When the Cisco 7960 uses a local power cube, a single expansion module can receive power from the cube attached to the Cisco 7960. If the Cisco IP Phone 7960 receives in-line power, the single expansion module requires a power cube.

For two expansion modules attached to the Cisco 7960, a separate power cube is required for the expansion modules.

Technical Specifications

Table 6-4 lists the technical specifications for the Cisco IP Phone Expansion Module 7914.

Table 6-4 Technical Specifications for Cisco IP Phone Expansion Module 7914

Type	Description
Dimensions	Height: 8 in. (20.3 cm) Width: 4.75 in. (12.1 cm) Depth: 2 in. (5.1 cm)
Weight	0.82 lb (.36 kg)
Temperature	Operating: 32 to 104ºF (0 to 40ºC) Nonoperating: 14 to 140ºF (–10 to 60ºC)
Relative humidity	Operating: 10 to 95% (noncondensing)
Power	100 to 240 VAC, 50 to 60 Hz, 0.5A (when using the AC adapter) 48 VDC, 0.2A (when using the in-line power over the network cable)
Cables	Two pairs of Category 3 for 10-Mbps cables Two pairs of Category 5 for 100-Mbps cables
Distance	Most Cisco IP phones should be within 330 ft (100 m) of a phone closet
Safety	UL 1950 CSA C22.2 No. 950 AS/NZS 3260 IEC 60950 EN 60950 TS001 CE Marking
Emissions	FCC (47CFR) Part 15 Class B EN 55022b Class B VCCI Class B AS/NZS 3548 Class B
Telecom	IC CS-03 FCC (47CFR) Part 68

Table 6-4 Technical Specifications for Cisco IP Phone Expansion Module 7914 (continued)

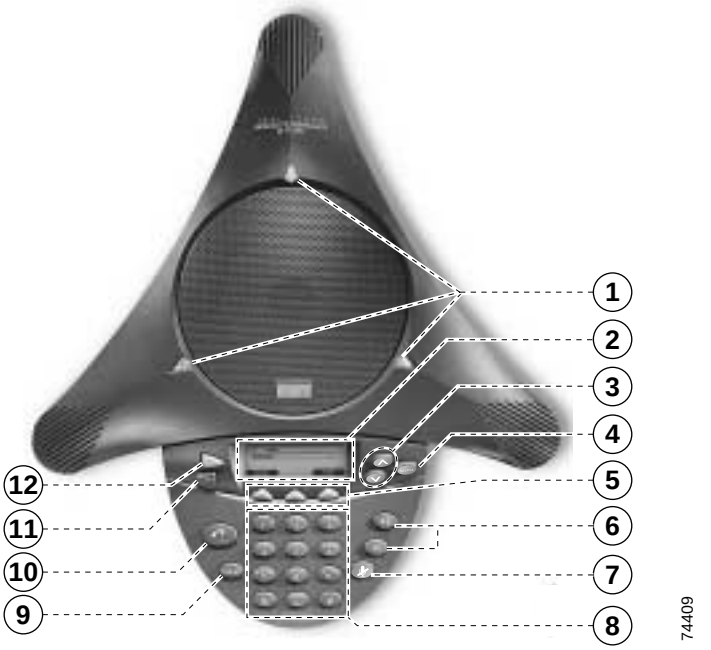
Type	Description
Standards	IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 100BASE-X ports IEEE 802.1D Spanning-Tree Protocol IEEE 802.1p CoS prioritization IEEE 802.1Q VLAN IEEE 802.3z 1000BASE-X specification 1000BASE-X (GBIC) 1000BASE-SX 1000BASE-LX/LH 1000BASE-ZX IEEE 802.3u 100BASE-TX specification IEEE 802.3 10BASE-T specification

Cisco IP Conference Station 7935

The Cisco IP Conference Station 7935 is designed for voice conferencing over an IP network, and is used in offices and in small- to medium-sized conference rooms. The IP Conference Station provides basic business conferencing features and functions such as conferencing multiple callers, holding or transferring a call, and muting the microphone. The IP Conference Station replaces a traditional analog conferencing unit on an IP telephony network.

The IP Conference Station has three microphones, which allow conference participants to move around while speaking. In addition to the regular dialing pad, the conference station provides three soft keys and menu navigation keys that guide a user through call features and functions. The LCD display shows time and date, calling party name and number, the digits the user dialed, and the feature and line status as shown in Figure 6-4.

Figure 6-4 Cisco IP Conference Station 7935



1	LEDs—Indicate call status.	**7**	Mute button—Turns call-muting on or off.
2	LCD screen—Displays instructions and information.	**8**	Dialing pad—For dialing numbers and input for a menu selection.
3	Scroll buttons—For navigating through the menu options.	**9**	Redial button—Redials the last number dialed.
4	Select button—For choosing a menu option.	**10**	Phone button—For placing, answering, or disconnecting a call.
5	Soft keys—Functions change with the call state.	**11**	Exit button—For closing a menu, a list, or the Phone Book.
6	Volume buttons—For increasing and decreasing caller and speaker volume.	**12**	Menu button—For accessing Call Functions, Phone Book, Settings, Admin Setup, and System Information menus.

Key Features

The Cisco IP Conference Station 7935 includes the following key features:

- Supports standard business telephony features including: call hold, call transfer, call release, mute conference (ad-hoc and meet-me), park, and pick up.
- Uses software upgrades from Cisco CallManager to allow the product to grow with system capabilities.
- Provides two-way conversations without clipping and distortion by using full-duplex operation. The system adapts to changes in the acoustic conditions of the room.
- Provides uniform, 360-degree room coverage of small- to medium-sized conference rooms or offices by using a digitally tuned speaker and three microphones.
- An integrated keypad eliminates the need to receive or place calls from a separate phone.
- Reduces clutter on the desktop by having a single cable that combines network and power.
- Simple to install and use. It is configured by using Cisco CallManger administration.
- Uses DHCP for auto-address configuration to the IP network.
- Supports G.711 and G.729a audio compression.
- Has comfort noise generation and voice activity detection.
- Uses Cisco Discovery Protocol to Cisco Catalyst switch port providing protocol for E911 services, phone tracking, and asset/theft management.
- Has an RJ-45 port that provides 10/100BASE-TX Ethernet LAN connection to the IP network.
- Has a Settings function for adjusting display contrast, choosing from five adjustable ring tones, displaying the network configuration, and the call status.

Technical Specifications

The recommended environments for operating the Cisco IP Conference Station are closed offices and conference rooms up to 20 by 30 feet in dimension without major glass or ceramic surfaces, and with normal background air-conditioning noise.

Table 6-5 lists the technical specifications for the Cisco IP Conference Station 7935.

Table 6-5 Technical Specifications for Cisco IP Conference Station 7935

Type	Description
Dimensions	Height: 12.5 in. (31.5 cm) Width: 12 in. (30.2 cm) Depth: 2.25 in. (5.7 cm)
Weight	1.75 lb (0.8 kg)
Temperature	Operating: 32 to 104ºF (0 to 40ºC) Nonoperating: –22 to 131ºF (–30 to 55ºC)
Relative humidity	Operating: 20 to 85% (noncondensing)
Power	Power interface and network connection provided by the power interface module (PIM)
Audio bandwidth	300 to 3500 Hz
Speaker volume	85 dB peak volume at 0.5 meters
Distance	Most Cisco IP phones should be within 330 ft (100 m) of a phone closet
Safety	UL 1950 CSA C22.2 No. 950 AS/NZS 3260 IEC 60950 EN 60950

Table 6-5 Technical Specifications for Cisco IP Conference Station 7935 (continued)

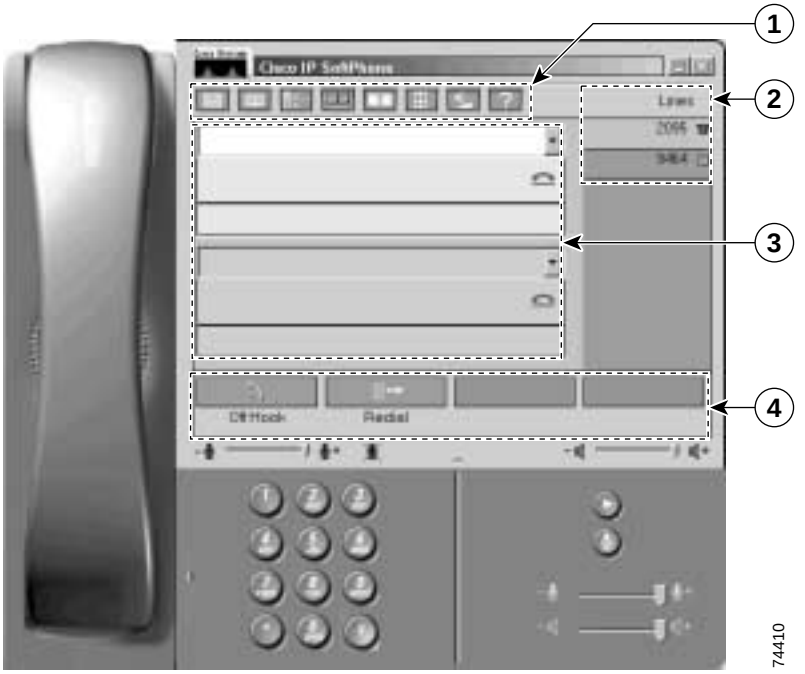
Type	Description
Emissions	FCC Part 15 (CFR 47) Class B CES-003 Class B EN 55022 Class B CISPR22 Class B VCCI Class B AS/NZS 3548 Class B EN55024
Telecom	IC CS-03 FCC (47CFR) Part 68
Standards	IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 100BASE-X ports IEEE 802.1D Spanning-Tree Protocol IEEE 802.1p CoS prioritization IEEE 802.1Q VLAN IEEE 802.3z 1000BASE-X specification 1000BASE-X (GBIC) 1000BASE-SX 1000BASE-LX/LH 1000BASE-ZX IEEE 802.3u 100BASE-TX specification IEEE 802.3 10BASE-T specification

Cisco IP SoftPhone

Cisco IP SoftPhone is a desktop application that turns a computer into a full-feature telephone, with call tracking and one-click dialing from online directories. By combining the Cisco IP SoftPhone with a Cisco IP phone, calls can be placed, received, and controlled from a desktop PC.

Figure 6-5 shows the main components of the Cisco IP SoftPhone.

Figure 6-5 Cisco IP SoftPhone



1	Icon bar	**3**	Call blocks
2	Lines	**4**	Context-sensitive button bar

Key Features

Cisco IP SoftPhone includes the following key features:

- Cisco IP SoftPhone can be used as a standalone phone—Place and receive all calls through a computer rather than an IP phone; the PC must have a full-duplex sound card with appropriate drivers installed, and it must also have a computer headset or computer handset.
- Cisco IP SoftPhone used with a Cisco IP phone—Control calls from the computer or IP phone; both devices show the same current call state.
- Online dialing and directories—Place calls using directory servers, web pages, and the computer keyboard; integrates with the CallManager directory service; automatically translates alphanumeric dialing strings into keypad digits.
- Call tracking—Display and log caller address, caller name, and phone number; view call log anytime for a history of calls (including missed calls) to see which line placed or received the call, the call duration, type of call, and how the call ended.
- Audio conferencing—Initiate a conference call by clicking the conference button and dragging a directory entry to the active call block; full audio conferencing capabilities allow up to six parties to participate; support full-duplex audio so that people can speak simultaneously; roster shows the current list of participants.
- Virtual Conference Room desktop collaboration—Create online meetings in which all parties can be heard and any party can share a document, application, or whiteboard, with other participants; integrate with Microsoft NetMeeting for video and other modes of collaboration. Virtual Conference Room includes the following features:
  - Whiteboarding—Everyone in a call or audio conference can view, draw, and type simultaneously on a shared screen.
  - Application and document sharing—All meeting participants can view and work on files simultaneously.
  - Chat—Integrates with the Microsoft NetMeeting chat application to send a text message to all or selected participants in an audio or video call.
  - Video collaboration—Integrates with Microsoft NetMeeting to conduct video meetings and receive video calls in the NetMeeting video window even if unable to transmit video.

- Voice mail integration—Integrates with a voice-mail system to transfer calls or place calls directly into a voice mailbox.
- CallManager services—Uses the services of CallManager to route calls through an IP telephony network.

System Requirements

Table 6-6 lists the system requirements for installing and using Cisco IP SoftPhone on a PC.

Table 6-6 Requirements for Using a Cisco IP SoftPhone System

Hardware/Software	Requirement
Operating system	Microsoft Windows 95, Windows 98 SE (Second Edition), Windows NT 4.0 with Service Pack 4 or later, or Windows 2000
Free disk space	40 MB
Temporary disk space	60 MB (20 MB is used just for installation)
Processor	Pentium 166 MHz or faster; a Pentium 266 MMX or faster is recommended
Memory	64-MB RAM (or more)
Internet browser	Microsoft Internet Explorer 4.01 or later, or Netscape Navigator 4.06 or later with Internet Explorer 4.01 or later also installed (Cisco IP SoftPhone requires the Java Virtual Machine [JVM] included with Internet Explorer)
Sound card	Microsoft Windows-compatible full-duplex sound card (not required if a USB microphone/headset is used)
Computer headset or handset	Any PC-compatible headset or handset (microphone and headphone)
Microsoft NetMeeting client application	Version 3.01

Cisco CallManager Attendant Console

Cisco CallManager Attendant Console is designed to automate the user and administrative operations of a manual attendant console. The Cisco CallManager Attendant Console uses a graphical user interface and a Cisco IP phone to perform attendant console functions such as call handling and line-state monitoring. The attendant console can handle calls for an entire company or a department within a company, or a user can manage calls for a single IP phone.

The Cisco CallManager Attendant Console is installed on a PC that has LAN connectivity to the Cisco CallManager system. The attendant console works with a Cisco IP phone that is registered to a Cisco CallManager system (one console for each phone that is used as an attendant console). Multiple consoles can connect to a single Cisco CallManager system to share the call load.

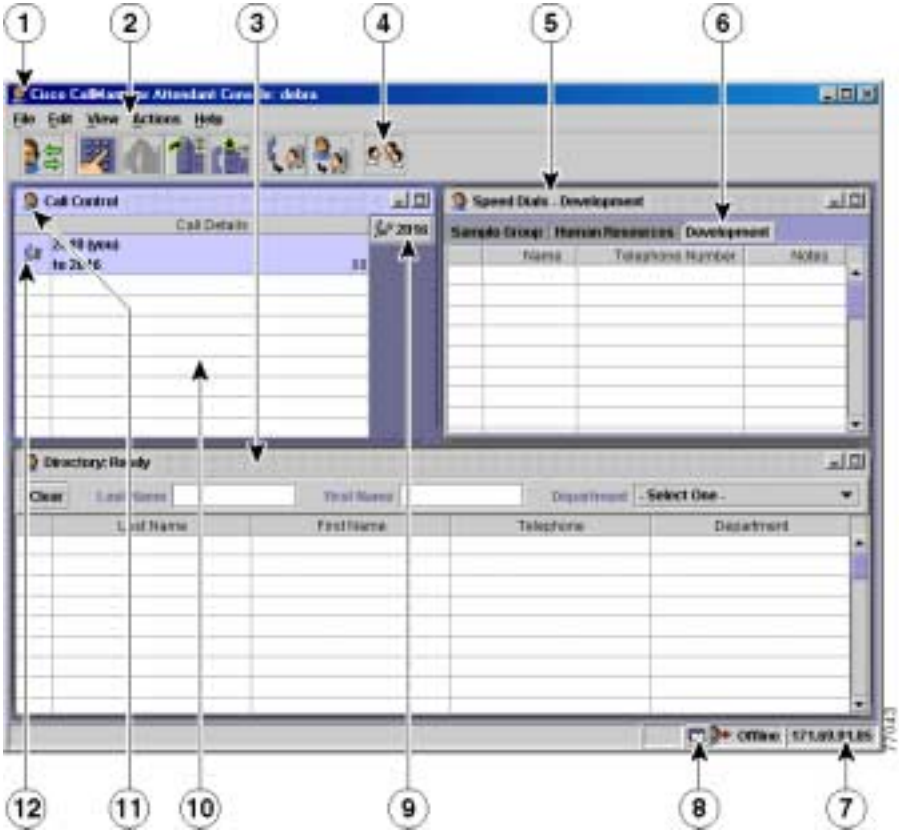
Cisco CallManager Attendant Console lets the user do the following tasks:

- Answer, place, manage, or direct calls
- Configure and use speed dial buttons which can be grouped in multiple tabs
- Look up directory numbers, manage or route calls, and view line status for users and resources contained in the Cisco CallManager database

Cisco CallManager Attendant Console replaces Cisco WebAttendant and works with Cisco CallManager 3.1 or later.

Figure 6-6 shows an overview of the Cisco CallManager Attendant Console user interface.

Figure 6-6 The Cisco CallManager Attendant Console Interface



1	Cisco CallManager Attendant Console window	**7**	Cisco CallManager server IP address
2	Menu bar	**8**	Pop to Top icon
3	Directory pane	**9**	Operator Line button
4	Call Control toolbar	**10**	Call Details area
5	Speed Dial pane	**11**	Call Control pane
6	Speed Dial Group tab	**12**	Line Status area

Key Features

Cisco CallManager Attendant Console includes the following key features:

- Loop keys— Provides for simultaneous management of all lines available on the associated IP phone.
- Line status—Displays icons to show these line states:
  - Handset with 3 dashes—The line is idle.
  - Handset with up arrow—A call is ringing on the line.
  - Handset with down arrow—The line has a call on hold.
  - Handset with two-way arrows—The line is busy.
  - Handset with question mark—The line state is unknown.
- Toolbar—Provides configurable function keys for logging in or out, for answering and releasing calls, and for other call handling tasks.
- Speed-dial buttons—Provides unlimited programmable buttons for placing calls and monitoring phone status for speed-dial lines. Tabs provide for grouping speed-dial lines.
- Directory view—Provides a line status record for every line appearance in the Cisco CallManager cluster. Searchable by last name, first name, extension, and department. Uses the same line status indicators.
- Headset capability—Uses the same headset requirements of the Cisco IP phones.
- Drag and drop operation—Provides quick call management by dragging the call to the directory number for transferring the call.
- Keyboard shortcuts—Used as an alternative to mouse operations.

Technical Specifications

Table 6-7 lists the system capacities and capabilities of Cisco CallManager Attendant Console.

Table 6-7 System Capabilities of the Cisco CallManager Attendant Console

System Capabilities	Description
Capacities	32 hunt groups (pilot numbers) per Cisco CallManager cluster. 16 hunt group members per hunt group. As many call loops per CallManager Attendant Console as configured on the controlled IP phone device. Any loop can be a hunt group member. 96 Cisco CallManager Attendant Consoles per cluster. Maximum of 512 simultaneous calls (32 hunt groups, each with 16 members) on as many as 96 configured CallManager Attendant Consoles.
Administration	System device configuration and operation through a web interface; there are no operator applications to install at each operator's PC.
Redundancy	Multiple operators can be assigned to the same loop/pilot. The operator monitors the same lines. If an operator station fails or is off line, the calls are distributed to all other operators with the same loops.
Server Component	Is Installed on the SPE running Cisco CallManager 3.1(x) and 3.2(x). Download from CCO for existing and new Cisco CallManager systems Will be bundled with Cisco CallManager 3.3(1) and later
Client System Requirements	Operating System—Microsoft Windows 98, ME, NT 4.0, Windows 2000 Basic system—Pentium II 366-MHz processor with 128 MB of RAM

Features of LAN-Based Switching Technologies

Cisco Catalyst switches allow full integration of voice, video, and data applications in the Cisco ICS 7750 system. The Cisco ICS 7750 system can include the following switches:

- Catalyst 3524-PWR XL Switch, page 7-1
- Catalyst 4000 Switches, page 7-6
- Catalyst 6000 Switches, page 7-7

The Catalyst 3524-PWR XL switch and Catalyst 4000 switches allow LANs to fully integrate voice, video, and data applications. Catalyst 6000 switches are primarily for enterprise and service provider environments.

Catalyst 3524-PWR XL Switch

The Catalyst 3524-PWR XL switch was developed for use with the Cisco ICS 7750 to allow full integration of voice, video, and data applications. The Catalyst 3524-PWR XL switch has 24 10/100 switched ports with integrated inline power, which provides DC current to devices that can accept power over unshielded twisted pair (UTP) cabling, such as the Cisco 7900 family of IP phones. The Catalyst 3524-PWR XL switch also has two Gigabit Interface Converter (GBIC)-based Gigabit Ethernet ports, which support one full-duplex link (in a point-to-point configuration) or up to nine half-duplex links (in a stack configuration) to other Gigabit Ethernet devices. Figure 7-1 shows the front panel of the Catalyst 3524-PWR XL switch.

Figure 7-1 Catalyst 3524-PWR XL Switch Front Panel

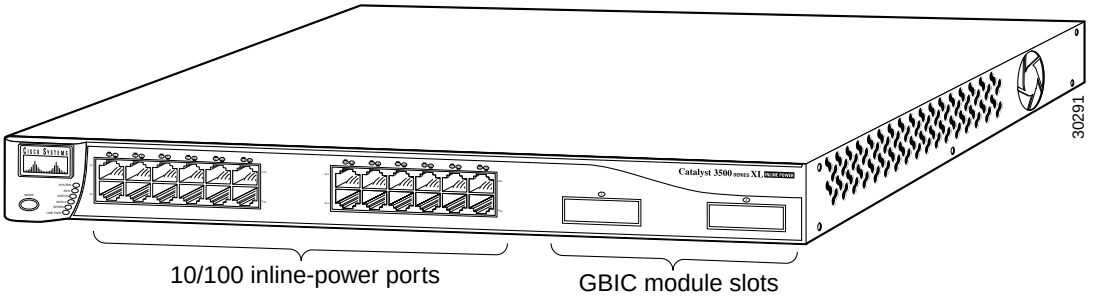
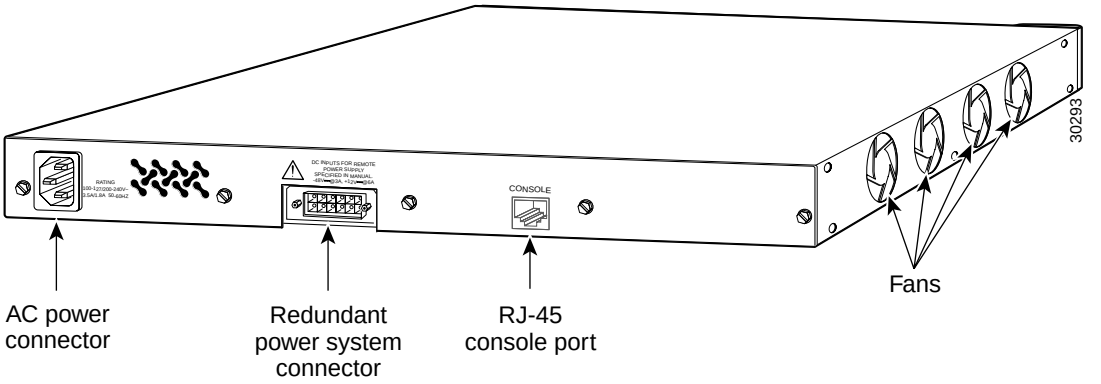


Figure 7-2 shows the back panel of the Catalyst 3524-PWR XL switch.

Figure 7-2 Catalyst 3524-PWR XL Switch Back Panel



Key Features

The Catalyst 3524-PWR XL switch has the following key features:

- 24 autosensing 10/100 Ethernet ports: full-duplex operation delivering up to 200 Mbps.
- Two fixed GBIC-based Gigabit Ethernet ports: full-duplex operation delivering up to 2 Gbps, supports one full-duplex link (in a point-to-point configuration) or nine half-duplex links (in a stack configuration).

- IEEE 802.1p support: dual-priority forwarding queues on each 10/100 and Gigabit Ethernet port, enabling network traffic prioritization and seamless data, voice, and video integration.
- Bandwidth aggregation through Fast EtherChannel and Gigabit EtherChannel technologies, offering from 400 Mbps to Gbps of aggregated bandwidth between switches, to routers, and to individual servers.
- Cisco Inter Switch Link (ISL) and IEEE 802.1Q trunking support on all ports: supports automatic segmentation of phone and data endpoints into separate logical networks.
- Supports 8192 Media Access Control (MAC) addresses.
- IEEE 802.3z compliance and support for Cisco GBIC modules:
  - GigaStack GBIC: for creating a 1-Gbps stack configuration of up to nine Catalyst 3500 XL switches; the maximum distance for a GigaStack GBIC-to-GigaStack GBIC connection is 1 m.
  - 1000BASE-SX GBIC module: for fiber connections of up to 550 m.
  - 1000BASE-LX/LH GBIC module: for fiber connections of up to 10 km.
  - 1000BASE-ZX GBIC module: for fiber connections of up to 100 km.
- Cisco Group Management Protocol (CGMP) enables a switch to selectively and dynamically forward routed IP multicast traffic to targeted multimedia end stations, reducing overall network traffic.
- Cisco IOS command-line interface (CLI) support provides a common user interface and command set through the console port or Telnet.
- CiscoView device-management application support.
- Cluster Management Suite support: a web-based tool for managing switch clusters or an individual switch through a single IP address.
- Simple Network Management Protocol (SNMP) support for in-band management.
- Power redundancy: supports an optional Cisco RPS 300 that operates on AC input and supplies DC output.
- Inline power
  - Can provide inline power for Cisco IP phones from all 24 10/100 Ethernet ports.

- Autodetection and control of inline phone power on a per-port basis on all 10/100 ports.
- Support for fan-fault and over-temperature detection through Cluster Management Suite (CMS).

Technical Specifications

Table 7-1 lists the technical specifications for the Catalyst 3524-PWR XL switch.

Table 7-1 Technical Specifications for Catalyst 3524-PWR XL Switch

Type	Description
Dimensions	Height: 1.75 in. (4.45 cm) Width: 11.82 in. (30.02 cm) Depth: 17.5 in. (44.45 cm)
Weight	10.25 lb (4.65 kg)
Temperature	Operating: 32 to 113ºF (0 to 45ºC) Nonoperating: –4 to 149ºF (–20 to 65ºC)
Relative humidity	Operating: 10 to 85% (noncondensing)
Altitude	Operating: 10,000 ft (3000 m) Nonoperating: 15,000 ft (4570 m)
AC input voltage	100 to 127/200 to 240 VAC (autoranging) 50 to 60 Hz
DC input voltages	–48V at 3A +12V at 6A
Power consumption	325W (with 24 IP phones connected) 1100 Btus per hour
Performance	10.8-Gbps switching fabric 6.5-million pps wire-speed forwarding rate for 64-byte packets 5.4-Gbps maximum forwarding bandwidth 4-MB memory architecture shared by all ports 8-MB DRAM and 4-MB Flash memory 8192 MAC addresses

Table 7-1 Technical Specifications for Catalyst 3524-PWR XL Switch (continued)

Type	Description
Safety	UL 1950, Third Edition CAN/CSA 22.2 No. 950-95, Third Edition NOM-019-SCFI AS/NZS 3260 and TS001-1997 IEC 60950 with all country deviations EN 60950 with Amendments A1-A4 and A11 CE Marking
Emissions	FCC Part 15 Class A EN 55022b Class A (CISPR 22 Class A VCCI Class A AS/NZS 3548 Class A BCIQ CE Marking
Standards	IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 100BASE-X ports IEEE 802.1D Spanning-Tree Protocol IEEE 802.1p CoS prioritization IEEE 802.1Q VLAN IEEE 802.3z 1000BASE-X specification 1000BASE-X (GBIC) 1000BASE-SX 1000BASE-LX/LH 1000BASE-ZX IEEE 802.3u 100BASE-TX specification IEEE 802.3 10BASE-T specification
Mounting options	19-in. rack

Catalyst 4000 Switches

Catalyst 4000 series switches provide advanced enterprise switching solutions for wiring closets and data centers that include the following key features:

- Layer 2 and Layer 3 switching and services.
- 18 million packets-per-second (Mpps) throughput, with 24-Gbps switching bandwidth.
- 10/100 Fast Ethernet ports, Gigabit Ethernet ports.
- Power supply bays support redundant, load-sharing, fault-tolerant AC power supplies.
- Meet requirements for device redundancy, link resiliency, and network availability.
- Dedicated bandwidth to individual users, servers, printers, and high-speed connections to company servers.
- Integrated Layer 3 services engine:
  - Scalable 6-Mpps Layer 3 services engine of IP, IPX, and IP multicast protocols.
  - Up to 224 ports 10/100 Fast Ethernet plus dual Gigabit Ethernet uplinks (GBIC slot), including previously deployed Catalyst 4000 line cards.
  - High-performance CPU with Cisco IOS, system software.
  - Quality of service (QoS), multiple queues with weighted round robin (WRR) scheduling.
  - Comprehensive management tools based on standard CiscoWorks2000 applications.
  - Hardware-based access control list (ACL) support on dual Gigabit Ethernet uplinks.
  - Inter-switch link (ISL) and 802.1Q trunking on dual Gigabit Ethernet uplinks.

Catalyst 6000 Switches

Catalyst 6000 series switches offer integrated solutions for enterprise and service provider environments that include the following key features:

- Scalable, intelligent multilayer switching for enterprise and Internet service provider (ISP) infrastructures—hardware-based acceleration for Layer 2, 3, and 4 switching and services.
- Intelligent server switching and Web scaling technologies—accelerated server load balancing technique enables delivery of wire-speed server load balancing at rates of 15 Mpps; compliant with Cisco Web Cache Communication Protocol (WCCP) version 2.
- Integrated voice solutions—allows convergence of voice, video, and data wiring closets into a single IP-based network.
- Integrated network monitoring—supports full RMON-1 (RFC 2819) and RMON-2 (RFC 2021).
- LAN/WAN integration—offers security, traffic management, and QoS mechanisms.

CHAPTER 8

Features of Other Compatible Cisco Devices

The ICS 7750 environment supports several other Cisco devices, which let you add features to your system:

- Cisco 1750 Modular Access Router, page 8-1
- Cisco 2600 Series Routers, page 8-2
- Cisco Voice Gateway 200, page 8-3
- DT-24+ and DE-30+ Digital Gateway Modules, page 8-5

Cisco 1750 Modular Access Router

The Cisco 1750 modular access router is designed for a small or medium-size business or a small branch office to implement WAN services such as the following:

- Secure Internet, intranet, and extranet access with an optional, integrated firewall
- Multiservice voice/fax/data integration
- Virtual Private Network (VPN) access
- Broadband services such as xDSL and cable

The Cisco 1750 router has the following key features:

- Flexibility—full Cisco IOS support, multiprotocol routing (IP, Internetwork Packet Exchange [IPX], AppleTalk, IBM/SNA) and bridging
- Modular architecture—accepts WAN and voice interface cards, autosensing 10/100 Fast Ethernet, expansion slot for adding a VPN module
- Security—Firewall feature set; IPSec Data Encryption Standard (DES) and Triple DES (3DES) support; RISC processor enables software-based encryption performance at 512 kbps for VPNs; device authentication and key management such as IKE, X.509v3 digital certification, support for Certificate Enrollment Protocol (CEP) with certification authorities (CAs), such as Verisign and Entrust
- User authentication—supports Password Authentication Protocol/Challenge Handshake Authentication Protocol (PAP/CHAP), RADIUS, TACACS+
- VPN tunneling—supports IPSec, generic routing encapsulation (GRE), Layer 2 Tunneling Protocol (L2TP), Layer 2 Forwarding (L2F)
- Management—manageable through Simple Network Management Protocol (SNMP) (CiscoView and CiscoWorks2000), Telnet, and the console port
- Quality of service (QoS)—supports committed access rate (CAR), policy routing, weighted fair queuing (WFQ), generic traffic shaping (GTS), Resource Reservation Protocol (RSVP)

For more information about the Cisco 1750 modular access router, refer to the *Voice-over-IP Quick Start Guide*.

Cisco 2600 Series Routers

Cisco 2600 modular multiservice routers offer versatility, integration, and power to branch offices. With over 50 network modules and interfaces, the modular architecture of the Cisco 2600 series easily allows interfaces to be upgraded to accommodate network expansion.

Key Benefits

The Cisco 2600 series enables businesses to extend a cost-effective, seamless network infrastructure to the branch office with the following benefits:

- Investment protection—Because the 2600 series supports field-upgradable modular components, customers can easily change network interfaces without upgrading the entire branch office network solution.
- Lower cost of ownership—By integrating the functions of channel service unit/data service units (CSU/DSUs), ISDN Network Termination (NT1) devices, firewalls, modems, compression or encryption devices, and other equipment found in branch office wiring closets in a single, compact unit, the Cisco 2600 series provides a space-saving solution that can be managed remotely, using network management applications such as CiscoWorks2000.
- Multiservice voice/data integration—The Cisco 2600 series enables network managers to reduce long-distance interoffice calling costs and enables next-generation applications such as integrated messaging and web-based call centers. Using voice/fax modules, the Cisco 2600 series may be deployed in both Voice over IP (VoIP) and Voice over Frame Relay (VoFR) networks. When used with a packet voice trunk module, a single Cisco 2600 series router can support simultaneous processing of 60 voice calls, as well as routing and other services.
- Enterprise/Provider class solution—Meets the requirements of multiservice enterprises and their managed service CPE providers with high-reliability features, multiple WAN connections, and the ability to migrate from data-only, to time-division multiplexing (TDM) voice and data, to packetized voice and data infrastructure.

For more information about Cisco 2600 series routers, refer to the *Cisco 2600 Series Hardware Installation Guide*.

Cisco Voice Gateway 200

The Cisco Voice Gateway 200 (VG200) enables you to connect Cisco IP telephony solution products such as Cisco IP phones to the Public Switched Telephone Network (PSTN) or to a private branch exchange (PBX). Analog telephones or fax machines can also be connected.

The Cisco VG200 chassis can hold a network module (NM) that provides processing and digital signal processor (DSP) resources, and voice interface cards (VICs), which provide the physical voice interfaces. A typical configuration includes an NM-2V network module and two VICs. These VICs can be any combination of Foreign Exchange Station (FXS), Foreign Exchange Office (FXO), ear and mouth (E&M), or Basic Rate Interface (BRI) (both user and network sides), for a total of four ports. Another common configuration of the Cisco VG200 is to use the digital T1/E1 Packet Voice Trunk Network Module that supports up to 60 voice channels (2-E1).

Features

The Cisco VG200 has the following key features:

- Modular architecture—Enables interfaces to be upgraded to accommodate expansion or changes in technology as new services and applications are deployed.
- Ease of administration—Can be managed, controlled, and administered using Cisco CallManager, but can also be accessed directly using the same command-line interface (CLI) as other Cisco IOS software-based products. When used with Cisco CallManager 3.0 or later as a call agent, the Cisco VG200 functions as a Media Gateway Control Protocol (MGCP) gateway.
- Versatility—Provides a LAN interface to a fast10/100BASE-T Ethernet port, a console port for local access using a terminal, nonvolatile random-access memory (NVRAM) for storing configuration information, and dynamic random-access memory (DRAM) for main memory and shared memory. The Cisco VG200 supports MGCP on its FXS and FXO analog ports, while it supports H.323 on its T1 digital ports.

For more information about the Cisco VG200 gateway, refer to the *Hardware Configuration Guide for the Cisco VG200.*

DT-24+ and DE-30+ Digital Gateway Modules

The DT-24+ and DE-30+ digital gateways are modules that are used with Cisco CallManager to connect Cisco IP phones to the Internet. The DT-24+ or DE-30+ module is installed in a 32-bit Personal Computer Interface (PCI) slot in a PC desktop or server chassis.

Digital gateways differ from analog gateway products in that they support digital ISDN features including Direct Inward Dialing (DID) and caller ID. These features allow outside callers to dial directly to a particular user without going through an attendant (operator). In addition, digital interfaces usually provide a more economical interface choice when the number of trunks exceeds six to eight channels.

When more than one digital gateway is needed, the additional gateway can be treated as a separate gateway or aggregated with the other gateways as a common pool of channels. Any number of digital gateways can be installed in a network, and the number installed in a PC is limited only by the number of available slots.

Digital gateways communicate with Cisco CallManager, which allows the implementation of supplementary services such as holding, transferring, and forwarding of outside calls. Also, with proxy signaling provided by the Cisco CallManager, the digital gateways are fully compatible with H.323 V.2.

DT-24+ Digital Gateways

DT-24+ digital gateways provide the interface to the PSTN or existing PBX systems through T1 ISDN Primary Rate Interface (PRI) interfaces. DT-24+ digital gateways support up to 23 simultaneous channels of VoIP packet to circuit-switched adaption, G.711 encoding (A-law or mu-law), dual tone multifrequency (DTMF) detection, generation, and signaling, and line echo cancellation. Twenty-three simultaneous channels of G.723.1 encoding/decoding are also supported.

DT-30+ Digital Gateways

DT-30+ digital gateways provide the interface to the PSTN or existing PBX systems through E1 ISDN PRI interfaces. DE-30+ digital gateways support up to 30 simultaneous channels of VoIP packet to circuit-switched adaption, G.711

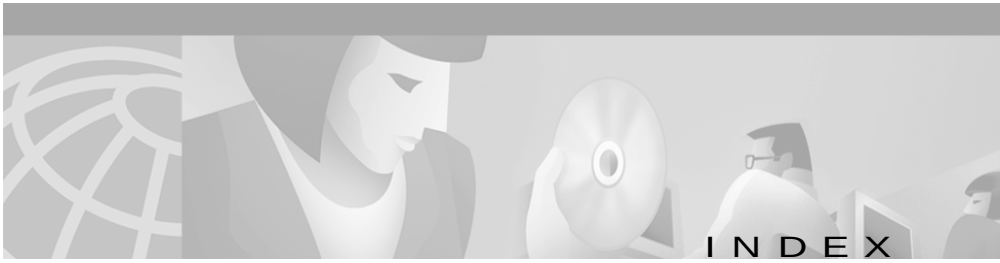
encoding (A-law or mu-law), dual tone multifrequency (DTMF) detection, generation, and signaling, and line echo cancellation. Thirty simultaneous channels of G.723.1 encoding/decoding are also supported.

Features

DT-24+ and DT-30+ digital gateways include the following features:

- A single PCI-based card (PCI bus for power only) with the following components on board:
  - Integrated DSPs
  - T1 (RJ-48C female) interface (DT-24+) or E1 (RJ-48C female) interface (DT-30+)
  - 10BASE-T Ethernet network interface (RJ-45 female)
  - Control processor with communications software to connect to Cisco CallManager (required) over TCP/IP/Ethernet link
  - Remote boot procedure with DHCP (for IP address) and TFTP software download (downloadable and upgradable)
  - T1/E1 PRI ISDN Layer 3 protocols, including National ISDN-2 (NI-2), 5 Electronic Switching System (5ESS), 5ESS custom, DMS100, DMS250, and other protocol support
- Both user-side and network-side ISDN signaling support to emulate terminal equipment and switching equipment, respectively
- Supports Skinny Gateway protocol communications with Cisco CallManager to provide supplementary services (such as hold and transfer) under control of IP telephony clients

For more information about the DT-24+ and DE-30+ modules, refer to the Cisco publication *DT-24+ or DE-30+ Module Installation and Configuration Note.*



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